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What Modern Equipment Has Done

One of a series of articles giving the actual results achieved by replacing obsolete with up-to-date equipment

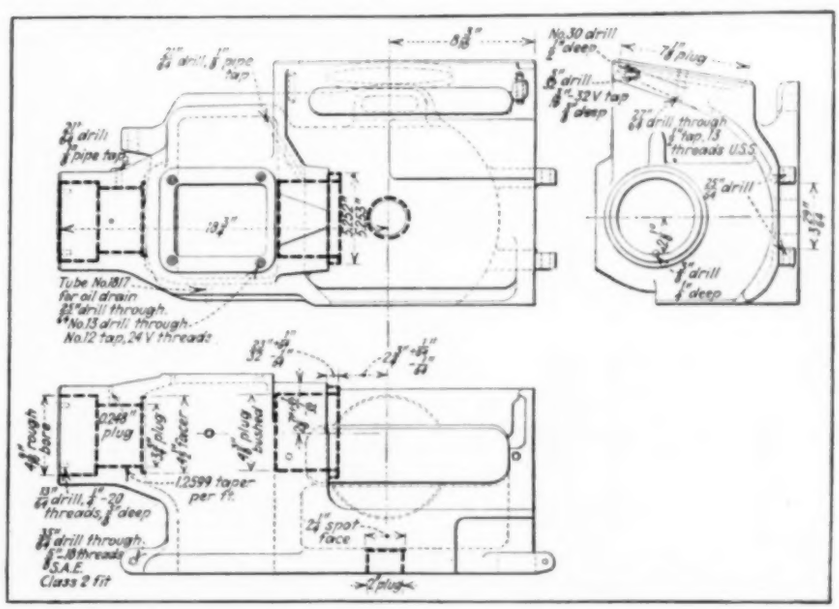
Shop No. 3

Cincinnati Grinders Incorporated

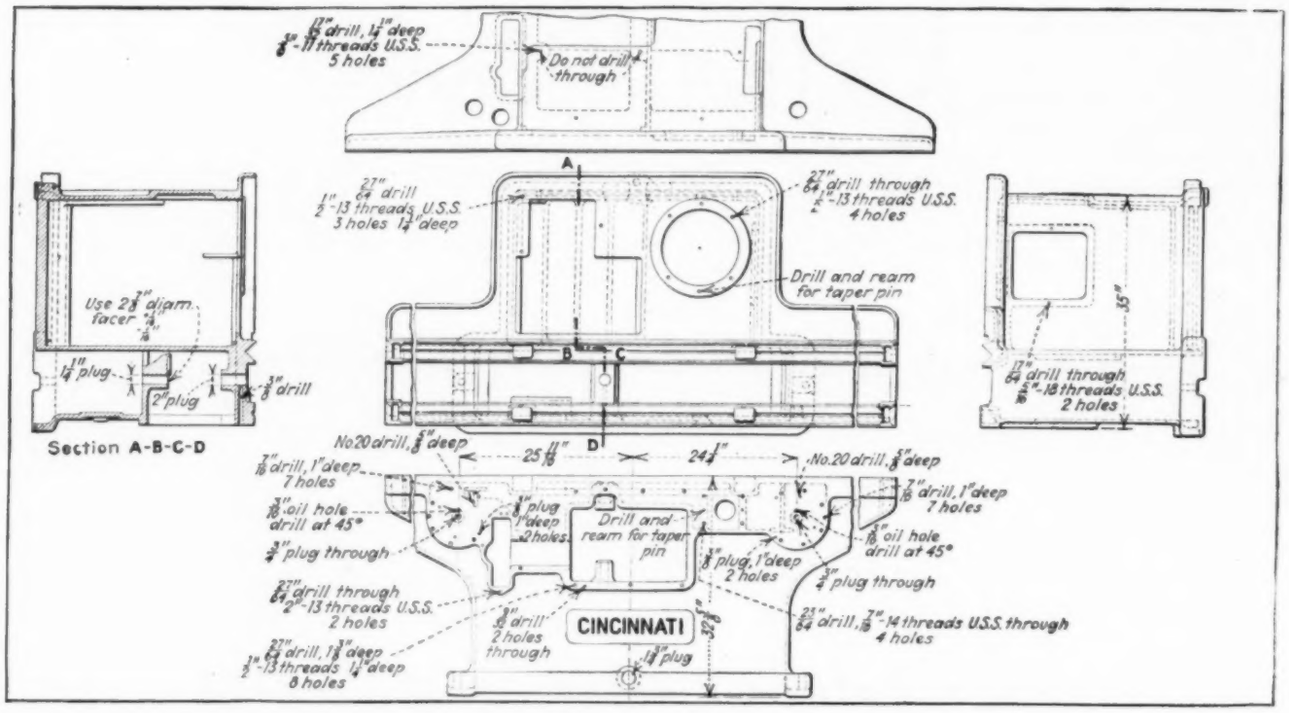
By W. Peaslee
Works Manager

GRINDERS, rightfully, are expected to be precision machines. In their manufacture, therefore, Cincinnati Grinders Incorporated, and the Cincinnati Milling Machine Company before it, always have used machine-tool equipment answering unblushingly to the descriptive term "modern." These companies attribute to the use of modern equipment the advantages of increased output for a given investment, but they recognize, also, the advantages of greater precision, a larger measure of satisfaction and ambition on the part of their workmen, and an increased confidence of those customers who visit the plants. The concentration of the building of grinding machines in a separate plant provided the opportunity to secure the most modern equipment available and, in its use, to receive confirmation of our beliefs concerning its advantages. We are satisfied that we are obtaining all of the advantages enumerated, but only the increase in output affords the data for mathematical presentation, and it is to that one advantage of modern equipment that this article is confined. The reader should remember that the comparisons are between machines that are strictly modern and machines that are but slightly older in point of design.

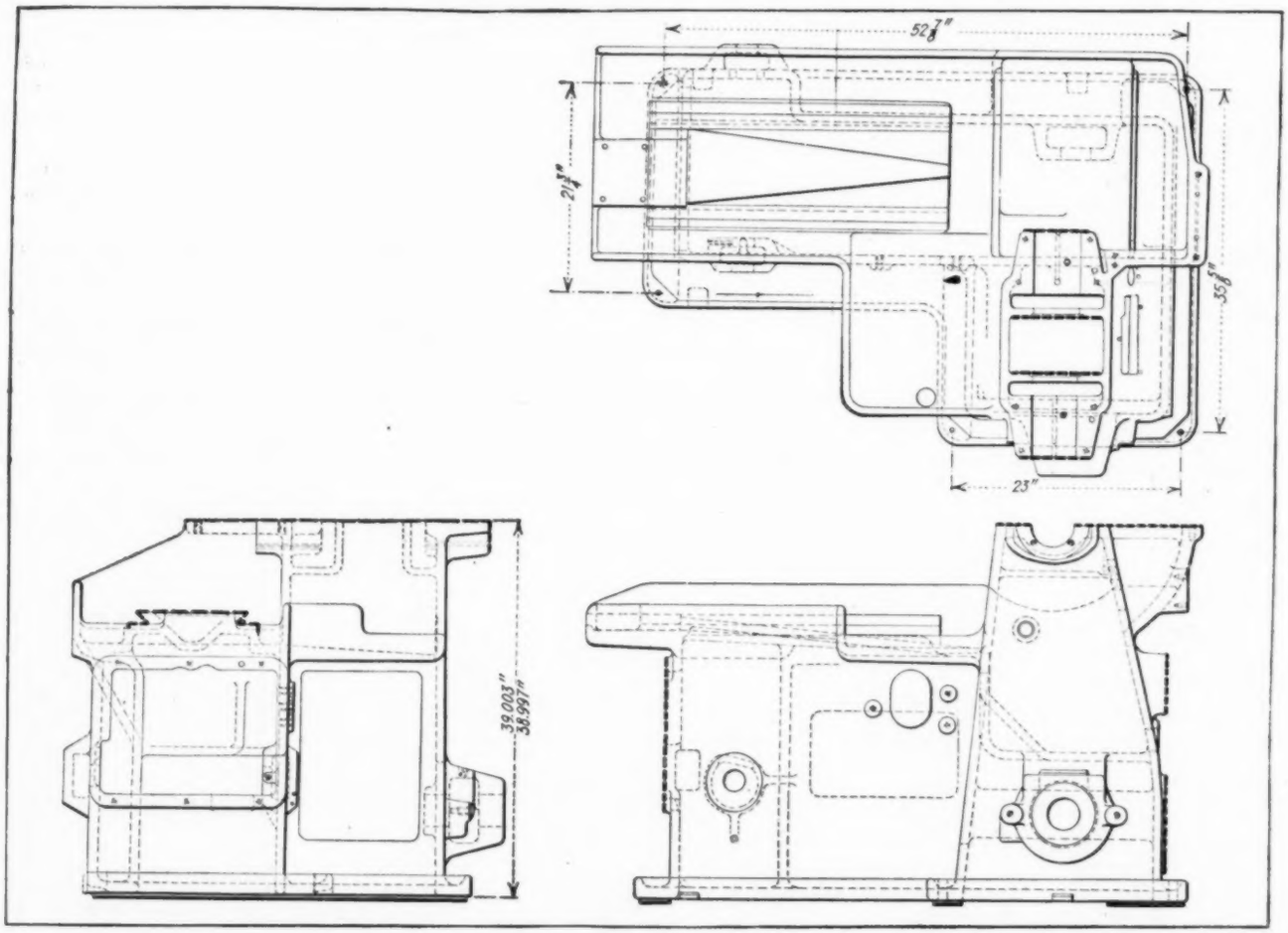
Few of the parts for grinders are made in large quantities, so that equipment must be selected for type of work rather than single piece or single operation. Our problem is first to select the right equipment and second to keep that equipment busy. Two groups of operations in machining the feed-wheel housing, Fig. 1, are performed on a radial drill, with increases in output of 37 per cent and 15 per cent, respectively. The first group includes boring, reaming, turning faces for spindle and 2-in. hole; the surfaces so machined are indicated by heavy broken line in the illustration. The second group includes the drilling and tapping of all other holes for which dimensions are given on the


No.30 drill 1" deep
7/8" plug
5/8" drill, 1/4"-32 V tap 1/2" deep
2 7/64" drill through 1/4" tap, 13 threads U.S.S.
2 1/4" drill
1" drill 1" deep
2" drill 1" pipe tap
Tube No.1817 for oil drain
21/64" drill through
No.13 drill through
No.12 tap, 24 V threads
.0248" plug
1" rough bore
1" plug
1" facer
1" plug bushed
.12599 taper per ft.
1 3/8" drill, 1/2"-20 threads, 1" deep
1" drill through 1 1/8" threads S.A.E. Class 2 fit
2 1/4" spot face
2" plug

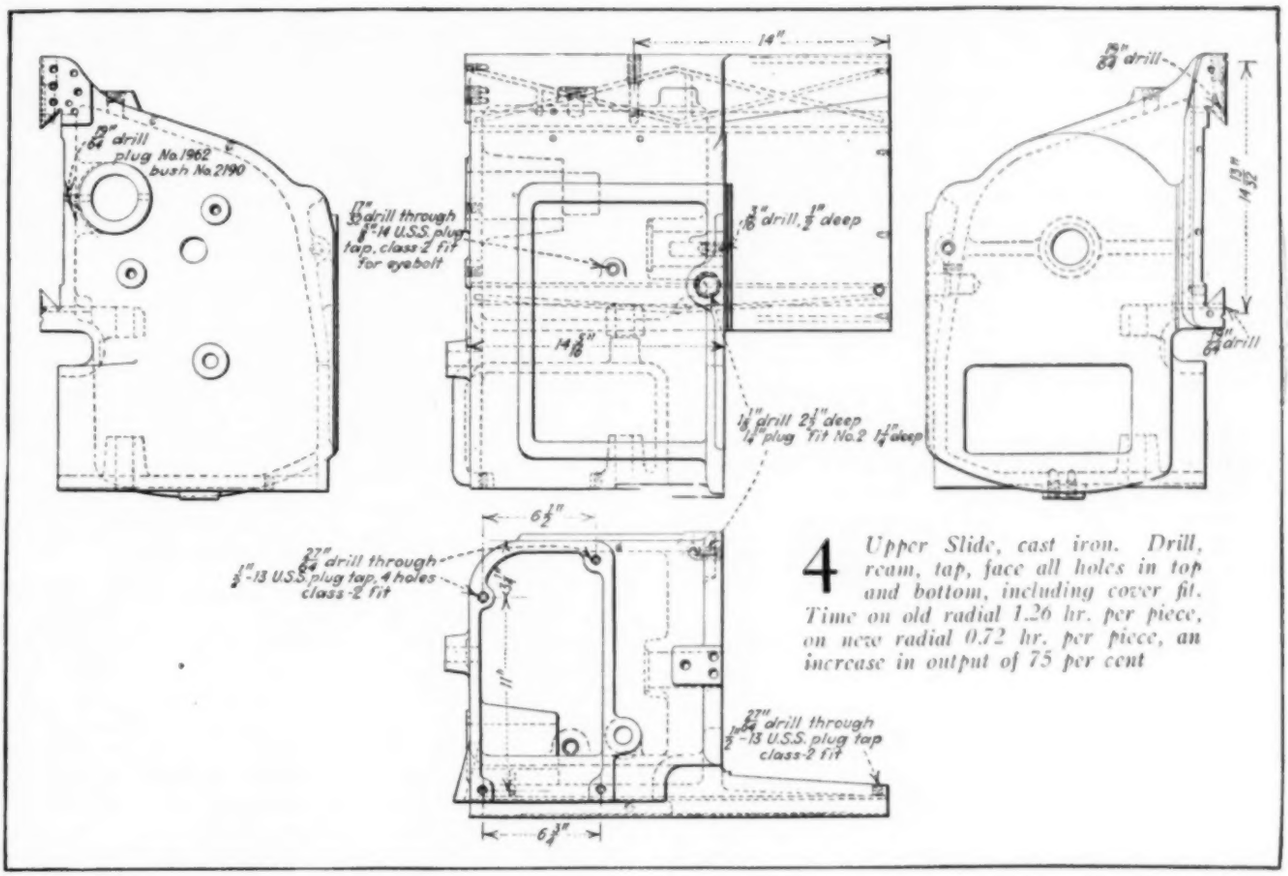
1 Feed-Wheel Housing, cast iron. Bore, ream, turn faces for spindle and 2-in. hole. Time on old radial 2.82 hr. per piece, on new radial 2.05 hr. per piece, an increase in output of 37 per cent. Drill and tap complete. Time on old radial 1.08 hr. per piece, on new radial 0.94 hr. per piece, an increase in output of 15 per cent



2 *48-In. Grinder Base, cast iron. Bore, ream, drill, tap, face and counterbore complete. Time on old radial* **5.1 hr.** *per piece, on new radial* **4 hr. per** *piece, an increase in output of 27 per cent. Actual time is 4.2 hr., but this includes 0.2 hr. crane time which was not included before and is therefore deducted*



3 *No. 2 Centerless Bed, cast iron. Mill top and bottom. Time by old method (planing) on old equipment 9.1 hr. per piece, by new method (milling) on new equipment 4.5 hr. Deduct 0.3 hr. for additional surfaces finished by milling, leaving 4.2 hr. to compare with 9.1 hr., giving an increase in output of 116 per cent*



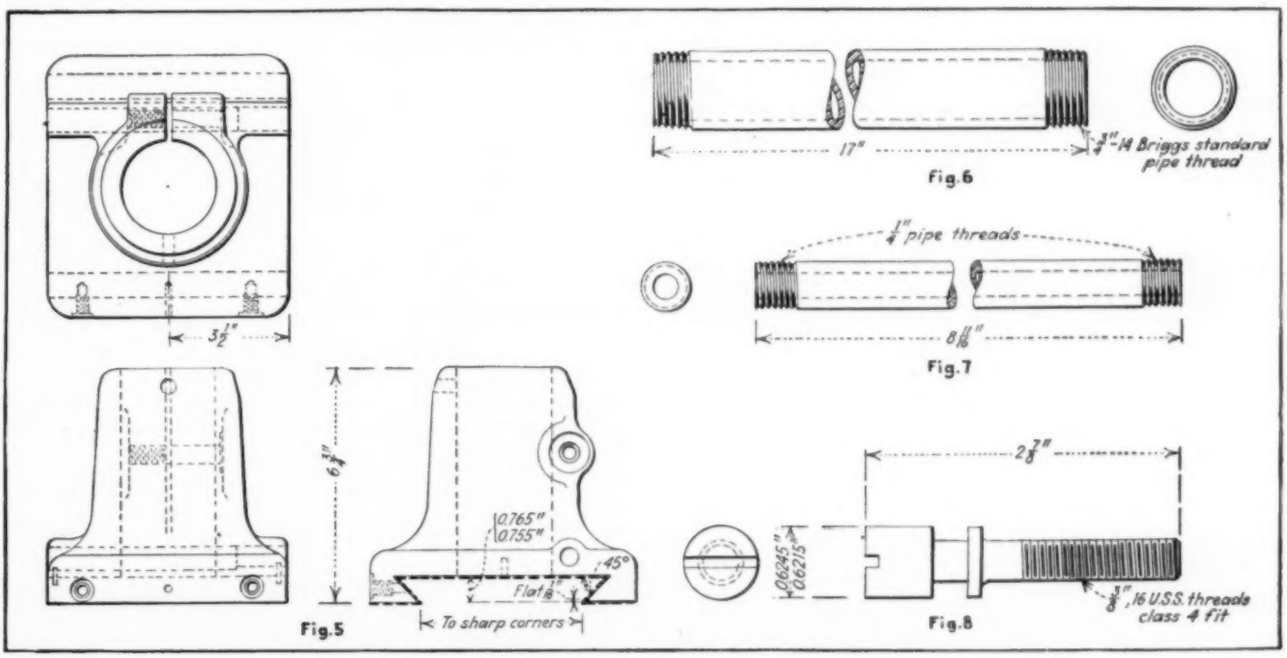
4 *Upper Slide, cast iron. Drill, ream, tap, face all holes in top and bottom, including cover fit. Time on old radial 1.26 hr. per piece, on new radial 0.72 hr. per piece, an increase in output of 75 per cent*

5 *Feed-Wheel Housing, cast iron. Mill bearings. Time by old method (planing) and on old equipment 35 min. per piece, by new method (milling) and on new equipment 26 min. per piece, an increase in output of 34 per cent*

6 *Pipe, brass. Cut off, chase and burr (chamfer). Time by old method (using cutting-off, chasing, and burring machines) 6 min. per piece, by new method (using pipe-threading machine) 4.2 min. per piece, an increase in output of 43 per cent*

7 *Pipe, brass. Cut off, chase and burr (chamfer). Time by old method (using cutting-off, chasing, and burring machines) 4.2 min. per piece, by new method (using pipe-threading machine) 2.1 min. per piece, an increase in output of 100 per cent*

8 *Gib Screw, chrome-nickel steel. Turn, form to size, face, bevel small end, and chase. Time by old method (using turret lathe, engine lathe, grinder and thread miller) 16.7 min. per piece, by new method (using turret lathe with ground chasing dies) 6.25 min. per piece, an increase in output of 167 per cent*



drawing. Both groups of operations formerly were performed on a radial, and the increased output is due entirely to the greater efficiency of the more modern machine. The actual times per piece on the old and new machines for the two operations are 2.82 hr. against 2.05 hr. per piece, and 1.08 hr. against 0.94 hr. per piece.

A drilling operation accompanied by an increase in output of 27 per cent consists of boring, reaming, drilling, tapping, facing and counterboring complete the 48-in. grinder base shown in Fig. 2. Actual times are 5.1 hr. and 4 hr. per piece, radial drills being used in both cases.

The next case involves a change in method as well as machine, both changes made possible, however, by improved machine design. Formerly the No. 2 centerless bed, Fig. 3, was planed on the top and bottom in 9.1 hr. It is now milled in 4.5 hr., this time including the rough milling of ends and inside of cap bearing, surfaces that were not machined as a part of the planing operation. The time required for the extra machining is 0.3 hr., leaving 4.2 hr. to be compared with 9.1 hr. The increase in output is therefore 116 per cent. Two set-ups are required. The surfaces machined in the first are indicated, in the illustration, by heavy solid lines, and the surfaces machined in the second set-up are indicated by heavy broken lines.

Another example of increased output resulting from the use of the latest type of radial is afforded by the drilling of the upper slide, Fig. 4. The operation includes drilling, reaming, tapping, facing all holes in top and bottom and cover fit. The holes referred to are indicated by dimensions in the drawing. On the older machine 1.26 hr. per piece was required. On the new machine the operation is finished in 0.72 hr. The increase in output is 75 per cent.

Milling is substituted for planing in machining the bearings of the feed-wheel housing, Fig. 5. Planing time 35 min. per piece, milling time 26 min. per piece, increase in output 34 per cent. When planed, the housings were mounted in jigs, ten in a row. As now machined they are roughed on a horizontal miller and finished on a vertical miller, gang cutters being used for both operations. The surfaces machined are indicated by a heavy broken line.

Worthwhile Savings on Small Parts

All of the preceding examples have referred to relatively large parts. That worthwhile savings are made on small parts also is indicated in the following cases, two of which involve change of method as well as the acquisition of new equipment.

The pipe, Fig. 6, is now cut off, chased, and burred (chamfered) on a pipe-threading machine of suitable design in 4.2 min. per piece. Formerly the time was 6 min. per piece, the cutting-off being done on a saw, the threading on a chasing machine and the chamfering on a burring machine. The increase in output is 43 per cent.

Similar changes in equipment were made to increase the output of the pipe shown in Fig. 7 by 100 per cent. The details of cutting-off, threading and chamfering are the same as for the piece illustrated in Fig. 6. The same modern pipe-threading machine is used for both pipes. The old time was 4.2 and the new time 2.1 min. per piece.

With an increase in output of 167 per cent, the gib screw, Fig. 8, is now turned, formed to size, faced, beveled and chased on small end on a turret lathe. Formerly it was turned and formed on a turret lathe, faced and centered on a lathe, ground, and thread milled. The use of ground dies gives the accuracy required without grinding and thus makes possible the completion of the job on one machine. For this part the old and new times were 16.7 and 6.25 min. per piece.

An average of the output increases cited is 68.7 per cent. Of course an average of this kind may be deceiving, although here it is approximately correct, since the greatest increases were about equally divided between parts involving great and small amounts of machining time. Remember that these increases were obtained by stepping up from relatively modern to thoroughly modern equipment. All of which indicates to me that shops using equipment in or approaching the obsolete class have almost unlimited opportunity to reduce the cost of making their products. The longer they wait the farther back in the race they will be, and if they wait too long more than modern equipment will be required to pull them to the front.

Punch Press Accidents

STATISTICS supplied by the National Safety Council indicate the appalling and needless sacrifice of fingers, and waste of money and production time, resulting from punch-press accidents.

In the state of New York alone during a recent year there were 1,495 punch-press accidents, resulting in 41,147 weeks of disability—the working time of about 800 men for a whole year. These accidents compelled the payment of $626,666 in compensation or enough to pay 200 men $60 a week each for a whole year.

And that is New York State alone. The figures will have to be multiplied by about eight to determine what a tremendous loss the Nation suffers from punch-press accidents every year which total about 120,000 and cause over 300,000 weeks of disability. The cost is over $5,000,000 in compensation annually or $17,000 per working day.

That tells nothing about the hundreds of broken, lacerated, or amputated hands or fingers; it tells nothing about the high casualty-insurance charges; it tells nothing about the untold hours of needless suffering and pain; it tells nothing about the interrupted and decreased production in the plants where these accidents occur.

Statistics also show that these accidents are increasing at the rate of about 20 per cent a year. Most of these accidents and losses can be prevented by automatic feeds, as has been pointed out over and over again by both the National Safety Council and the United States Government. The latter has published Bulletin No. 430 through the U. S. Department of Labor Statistics, and a thorough discussion is presented.

The May issue of *Punch Press News*, from which the above material was obtained, also gives additional data on punch-press accidents and the means of preventing them.

Krupp, of Essen, Germany, is reported to have produced a new cutting material, known as "Widia metal," that is being used for roughing cuts on cast iron and steel. Cuts 0.314 in. deep, in a mild steel bar, having slots to produce a shock on the cutting edge, were run at the rate of 560 ft. per min. In cast iron the same depth of cut was run at 780 ft. per min. The feed in steel was 0.015 in. and in cast iron, 0.032 in. per revolution. Widia is a cast metal that can be shaped only by grinding with a special abrasive wheel. It is used as a tip brazed to a suitable shank.

Handling Materials Via the Shortest Route

Features of a stove manufacturing plant which was laid out around the material handling system

IN LAYING OUT the new plant of the Peninsular Stove Company, Detroit, which has just been put in operation, the movement of materials from the raw stock to the finished product was given most careful thought. The departmental equipment was laid out hand in hand with the materials-handling system, because experience has shown that efficient interdepartmental transportation is one of the most important requirements in the manufacture of stoves and furnaces. Moving materials in a machine-like manner without side-tracking has two outstanding economic advantages: One, a reduction in manufacturing costs, and the other, greater productive efficiency. Without a uniform system, schedules cannot be maintained, shortages will develop, and general congestions will occur. Hence a visual picture of how the work should progress was the first consideration.

The plant is a one-story building measuring approximately 246 ft. in width by 809 ft. in length. The main departments are the press shop, the foundry, the enameling room, the assembling room, and the warehouse, or finished stock room. A layout of the plant is given in Fig. 1. Raw materials enter the plant at the rear end only, which is shown at the left. Pig iron, sand, and other materials for the foundry come in on the track shown at the top of the lay-out, and sheet-metal and finished parts are delivered on the track shown at the bottom. Suitable storage facilities are provided for these materials, a normal supply being kept in hand to overcome possible shortages.

Work leaving the foundry enters the left end of the assembling department, or passes through the enameling room first if required, and sheet-metal parts passing through the press shop and the enameling room likewise enter the assembling department at approximately the same location. Assembly of stoves is carried on mostly by roller conveyors, and the finished materials used in their construction are distributed along the conveyor lines as required.

The ends of the conveyor lines are located close to the warehouse, so that the finished stoves pass directly into that department where they can be marked for shipment, stored if necessary, or shipped immediately. Rail shipments go out on the same track that brings in the raw sheet-metal stock, using the same cars if necessary, inasmuch as freight cars are the same for both purposes. The track is extended through an inclosed portion of the warehouse built as a wing, and shown at the lower right. The opposite track also runs the length of the shop but only provides for the unloading of lumber required in the construction of crates.

Shipments made by truck are loaded at the platform shown at the extreme right, which is also constructed in the form of a wing. A feature of this platform is the saw-toothed design permitting trucks to park diagonally.

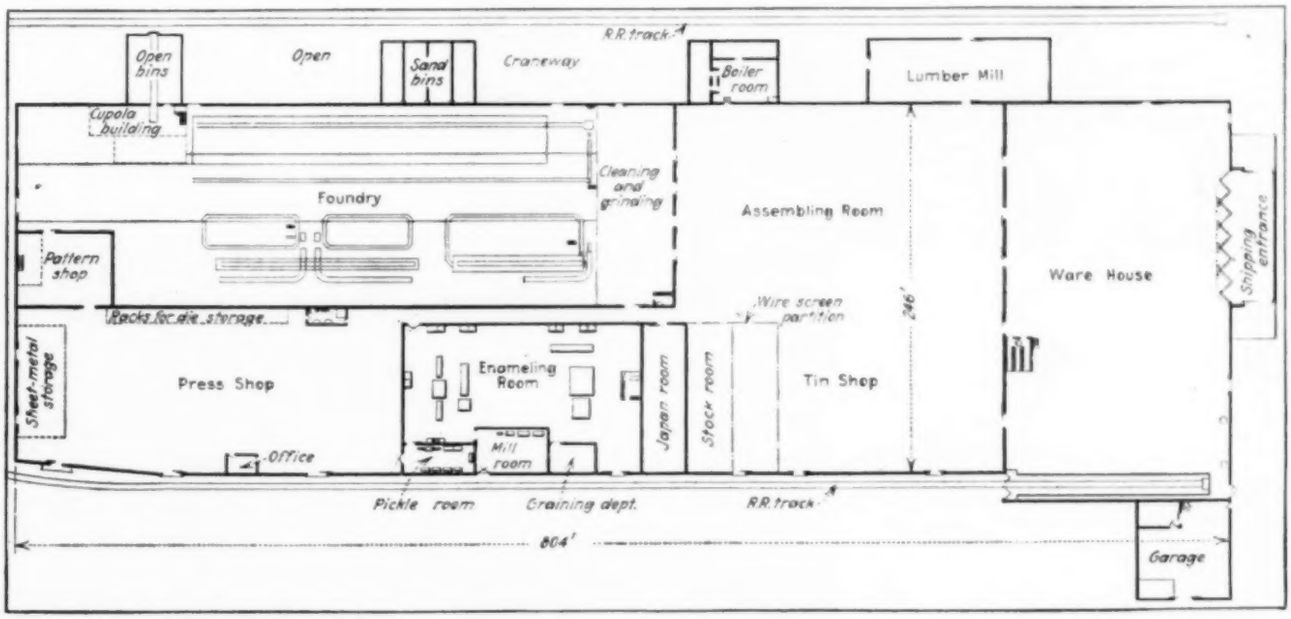


Fig. 1 — In laying out this stove plant the materials-handling system was visualized first, then the departments were arranged to suit. Raw materials are received at the rear of the shop where a supply is stored to offset possible shortages. The shop layout permits the work to progress in a straight path without back tracking

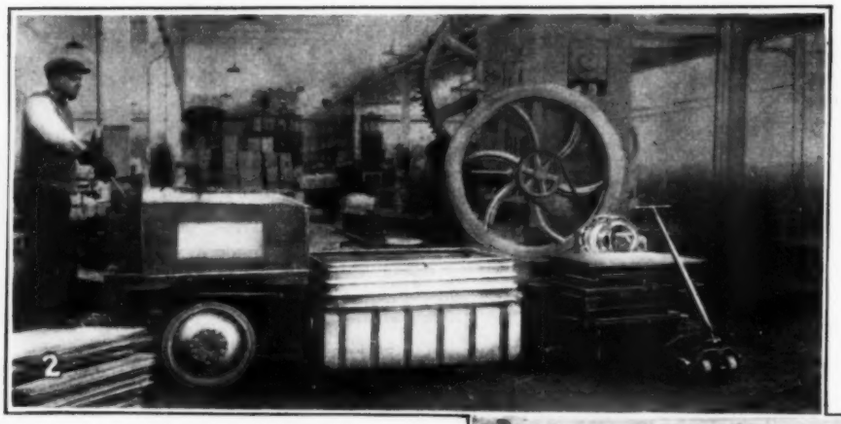


Fig. 2—Materials passing through the press shop are transported by electric truck, from one operation to the next, until they have been completed. Dies are handled by hand-lift trucks and elevator trucks in order to eliminate manual lifting. Suitable storage facilities for dies are provided along the inside wall of the shop, so that a change can be made in a relatively short time

Fig. 3—Stove bodies are assembled on stands and then are transferred to a roller conveyor for completion. Sheet-metal parts and finished castings are transported on rack trucks, which in turn are placed close to the stands to facilitate assembly. Small fittings such as screws and bolts are placed in trays located on the stands for convenience

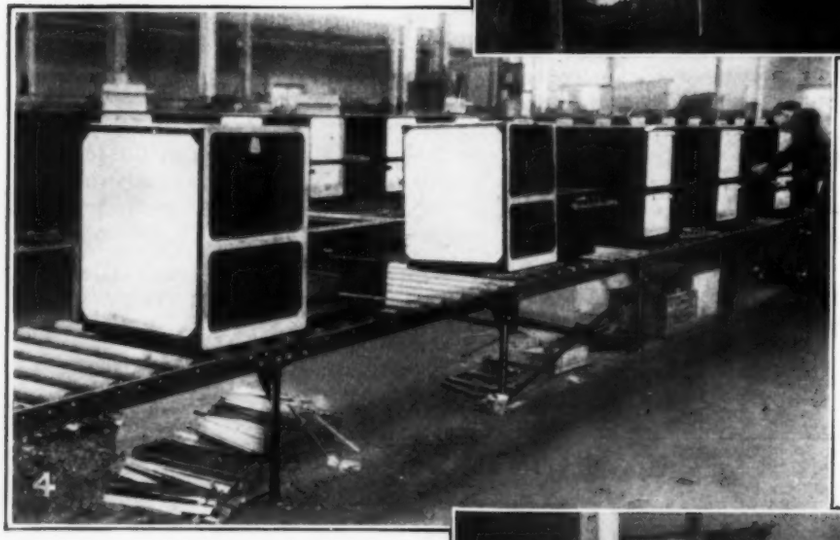
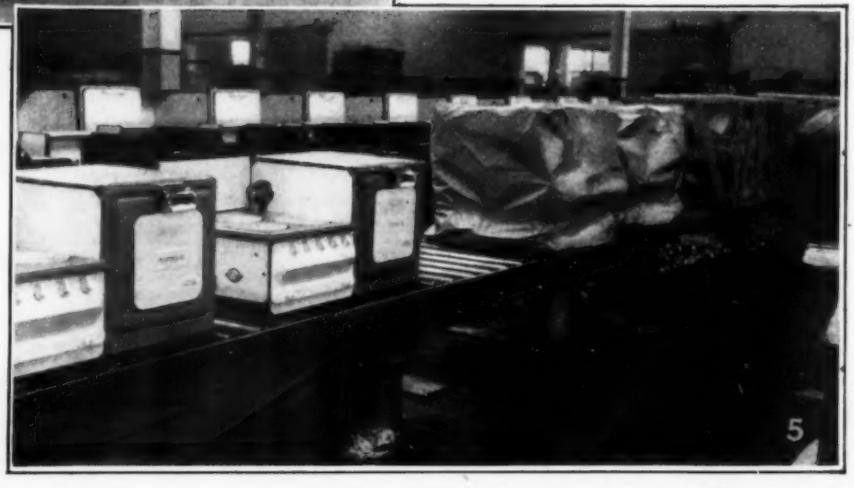


Fig. 4—Five conveyor lines, measuring 150 ft. in length, are used to complete the final assembly. This work includes the hanging of doors and panels, the assembling of manifolds, lining of ovens, and final test. Materials required are distributed along the lines at the point of usage to eliminate any possible lost time of having operators chase stock. This illustration shows gas-operated units in course of construction

Fig. 5—Electric stoves are assembled on conveyors, and when completed are crated at the end of the line as shown. The warehouse is located just beyond the end of the assembly conveyors, so that the completed work can be transferred there with a minimum of travel, and be marked for shipment, stored, or shipped immediately. Rail facilities and trucks both are used for shipping purposes



The truck to be loaded enters one side of the wing, backs into one of the stalls, which incidentally requires a minimum of operation, is loaded, and then departs from the opposite side of the building almost in a straight path. Either end or side loading of a truck can be carried on easily. This method of construction conserves floor space, avoids congestion, and reduces lost time.

Electric trucks transport materials through the press shop, starting with the flat stock that is passed through shears, then to the various presses, and finally to the pickle room. Metal stock boxes are used, as illustrated in Fig. 2, where a trucker is shown placing an empty box adjacent to one of the presses. In practice, a box of parts to pass through a press is placed at one side of the machine, and then as the operation is performed the finished parts are thrown into another box on the opposite side. At intervals the trucker shifts the box of completed parts to another press, or to the inspection bench.

In the same illustration is shown one of the hand-lift trucks and platforms used in transporting dies between the storage rack and the presses. The elevating truck shown at the right is utilized in changing dies in the press, so that between it and the hand trucks, manual lifting of dies is eliminated. This equipment has solved somewhat of a problem, since die changes are frequently made because of the different types of stoves and the large number of different parts manufactured.

After castings and sheet-metal parts for the gas-operated units have been enameled they are placed on rack trucks and transported to the assembly room where the body of the stove is built up on stands as shown in Fig. 3. At the rear may be seen a truckload of parts as received for the operation. Small screws, nuts, and fittings are placed in trays located on the stands where they are convenient to the operator.

The assembled stove bodies then are placed on a roller conveyor where they progress past several operators and have their doors hung, panels fitted, manifolds attached, ovens lined, and are finally tested and adjusted. Two of the five conveyor lines used for this work, which measure 150 ft. in length, are shown in Fig. 4. Electric stoves are assembled in a somewhat similar manner, and in Fig. 5 is illustrated the end of the conveyor line showing how the units are crated after being inspected.

The plant described turns out 300 gas and electric stoves and 120 furnaces daily. Careful plans have been laid to insure a uniform flow of stock through the shop at all times. The handling of materials on a scheduled basis is therefore an important factor in attaining production requirements.

Our American Merchant Marine

By Norman F. Titus

RECENT investigations by the Shipping Board and the National Council of American Shipbuilders reveal, in considerable detail, according to a paper presented by the author at the Fifteenth National Foreign Commerce Convention, the excessive cost of building ships in American yards under present conditions. The Shipping Board's conclusions indicate that the cost of constructing vessels in American yards ranges in accordance with the type of vessel, from 33 to 40 per cent higher than in British yards. The National Council of American Shipbuilders found that American costs were higher than British costs by 54 to 60 per cent, according to the size and type of vessel. For example, a 10,000-ton freighter built in American yards would cost $1,250,000, but if built in British yards the cost would be only $800,000. Thus the American cost would be $450,000 more than the British. With interest at 6 per cent, depreciation 5 per cent, insurance 5 per cent and repairs 2 per cent, the capital charges of 18 per cent on $450,000 the excess American cost would be $81,000 per year. In other words, such an American-built vessel would have to earn $81,000 before it would begin to compete with the British-built vessel on an operating basis.

The wage cost of a large number of American vessels, compared with an equal number of foreign vessels of similar types, was found to average about 49 per cent higher. The subsistence cost of crews on American vessels was found to be greater by an average of 32 per cent.

A further handicap is that cargo insurance on American vessels, in many cases, is higher than on foreign vessels. When we consider the national advantages flowing from a merchant marine we find:

1. The creation of a maritime prestige commensurate with our wealth and resources would result in a greater appreciation of American trade supremacy.

2. A merchant marine is a most effective form of advertising, and would stimulate our foreign trade.

3. Unquestionably, an American marine would have a beneficial effect on ocean freight rates.

4. Our own merchant marine would foster new and improved liner services, this aiding and assisting our foreign trade.

5. An American merchant marine keeps our dollars at home. Our maritime freight bill for the fiscal year 1926-27 was $760,000,000, of which American vessels earned only $228,000,000.

6. In times of national emergency, due to strikes or wars abroad, an American merchant marine would tend not only to stabilize rates, but also to assure space for our exporters and importers.

7. In controversial issues an American line with accessible headquarters in this country could be counted on for fairer and more equitable treatment to its patrons than a foreign line.

8. An American merchant marine may be reckoned to be of infinitely more value than foreign ships when it comes to development work in a pioneering trade. American owners would be much more willing to carry on an unprofitable trade, with anticipation of ultimate profitable operation.

Americans generally are practically unanimous for a merchant marine. In striking the balance between the adverse and the favorable factors, the sentiment throughout the country, as disclosed in the Shipping Board's 33 regional hearings and 9,000 questionnaires, indicated that Americans generally believe the advantages outweigh the disadvantages. The problem, as commonly stated, concerns the method of overcoming the handicaps and firmly establishing our merchant fleet to meet world competition.

By the introduction into American shipping of the principles of efficiency, economy and scientific management that are now standard practice in industry generally, the factor of comparative disadvantages, previously outlined, can be overcome.

Interesting Men in the Shop

"SEEMS to me, Bill, that men in the shop don't take half the interest in the job that we used to. Or is it just because I don't know them well enough?" Henry Hall, head of a large company building a highly specialized line of machinery, was holding forth to our good friend Bill Holland, who had worked beside him in their younger days.

"Guess you're right, Hank. But why should they? We used to know the boss as well as we knew each other. We knew where each job was going, and we often had to fudge up some scheme for doing it. Your men hardly know you by sight. Only those in the assembly department ever see a complete machine, and they don't know whether it goes to Camden or Calcutta."

"But I can't know all the men, Bill—the shop is too big. And it takes all my time to dig up the pay roll."

"That's only partly true, Hank. Of course you can't know all about every man and remember the names of all his children. But it might pay to take some of the time you spend digging up sod trying to hit the ball—not digging up the pay roll—and try to get a little closer to the shop. You can't expect the men to show much more interest in the shop than you do."

"Ouch, Bill—that's some wallop. Just what do you mean, anyhow?"

"Well, just suppose you spent an hour in the shop once in a while watching some of the nice work that is being done. There's a lot of it. If you show a real interest in some of the work, ask some of the men why they do this or that, and just how it works, they'll soon get the idea that you are human after all. They'll think the 'old man' is a real guy and they'll take more interest themselves."

"But I can't spend a lot of time there—not even all my golf time."

"Of course not, Hank. But a little will help. There are dozens of ways by which different concerns get the men's interest—and hold it. Just try to think what would interest you if you were in the shop. You'd want to know how the machines worked, and why, wouldn't you?"

"You bet I would."

"Well, why not give the shop men a chance? Take the men who make only certain parts and let them see where they go, how they work and why they have to be such a good fit."

"Don't believe they care a hoot about it, Bill."

"Others don't agree with you, Hank. Why do you suppose some of the best plants publish a little paper to keep the men posted on what other departments are doing?"

"Always seemed like a waste of money to me. Paper full of hot air and crude jokes. Who cares about that?"

"I'll admit some of the papers are pretty crude. But I've heard even you laugh at a joke that wasn't exactly polished—and not so long ago, either. I'm not preaching any kind of paper or telling you how to interest the men. But if you really want to interest them—as I think you do—you've at least got to give them a chance to be interested. They can't come to you, you've got to go to them, or get some real human guy who can show them that your side of the shop has just as many tough jobs to put through as their side has—and then some. And that your jobs depend on the way they do theirs.

"When a man does a good job, tell him so. If it's something very much worth while, reward him. That's what several of my friends do and find it pays, not only in dollars and cents but in a better understanding with the men."

"I wish you'd tell me more about it, Bill, but I'm not sold on the idea yet."

"Think it over a while, Hank. Then maybe I'll tell you what some of my other friends have done."

EXECUTIVE FORUM

Discussion

Making Power or Buying It

Perhaps there was a day in the history of power suppliers when break-downs in service occurred often enough to warrant the consideration of a small individual power plant as insurance against the consequent delays. If such was the case, that day has long since past. This is an age of specialization and quantity production. There is no more reason for continuing the manufacture of their own power by many plants still doing so than there would be for these plants to still make all their own tools, as was once the practice many years ago.

Why the practice of making their own power has persisted so long in many plants which now do specialized purchasing of all the accessories incidental to the manufacture of their product, is one of the unexplained mysteries of business. Perhaps it is pride in the magnitude of the investment concentrated in a single installation that accounts for it, but in but few instances is their retention justified by an impartial investigation and analysis of cost figures. —IRVING W. FLIERL

Making electricity is one of the forms of making your own tools instead of buying them. The tools you buy are made of right materials, on correct machines by skilled men, and then sold at a price that defies the individual shop in competition.

There is also another phase of the situation. The power company gives better service than the individual plant, because of the electric company's reserve power. Shut-downs from the lack of power are also of shorter duration, because the cause of the shut-down is more quickly found and corrected. Last, but not least, the investment is a consideration. The buying of power calls for only a nominal investment. Any business is far better off with the cost of the electric plant in cash as a reserve. Such a plan would provide for equipment as required for manufacturing, when such a purchase would be profitable. —GEORGE C. HODGES.

What Is Overhead?

Basing overhead on direct labor cost has been the commonly accepted practice, as Mr. Holland states. But in view of the greatly increased investment in machinery, with its consequent decrease in direct labor, it would perhaps be easier to revise the base. We have all learned to accept the principle of depreciation as applied to machines, estimating the probable useful life of a machine, and then writing off so much from its value each year. Why not go a step further and estimate the number of actual working days in a year we expect to use a given machine? We could then get a daily wage for a machine. Then, if we add this figure, which I consider perfectly logical, to the direct labor cost, and use it as a basis for overhead, we will have decreased the apparent overhead percentage.

There is also the possibility of putting designing as a direct charge rather than as overhead. Not only will this lower the overhead percentage, but it has the further advantage of pointing out the real cost on a given job. If charged directly to labor costs, these design costs will stand out, and create a tendency to charge them directly in estimating prices for future jobs.

—W. M. SEIFERT.

How Can I Regain "Dull Time" Overhead?

Overhead expenses must be paid, but the manufacturer who tries to make his customers pay higher prices during dull times than when he has plenty of orders is likely to lose the few orders he might have taken. This condition, if carried to the extreme, would leave all of the overhead unpaid.

There are lines of business which are seasonable so that dull and busy times are experienced each year and some concerns have met this condition by setting an average rate for the overhead and by running a profit and loss account for the overhead expenses. Each month this account is credited with the overhead earned and debited with the actual expense. During the dull season the expenses are greater than the amount earned while the reverse is true during the busy part of the year and every effort is made to balance the account by the end of the year. As the exact condition is known at all times, the management realizes how much back overhead must be earned and can arrange for special sales drives or other incentives. Some have found it helpful to offer special discounts during the dull period to encourage buying out of season.

It would seem probable that this plan, which helped the concerns with seasonable business, might also help a concern which experienced only occasional depressions and that such was the case was proved by one small manufacturing plant making a staple article, the selling price of which is pretty well held down by competition. As this plant is obliged to carry a fairly large inventory of finished goods and a fair supply of raw materials, it faced the unhappy condition of decreased sales and falling prices of both its finished product and of the raw materials.

According to this plant's cost system, practically all of the overhead expenses are charged

against the machines and enter into the costs as machine-hour rates based upon normal operating time. This arrangement had the advantage of showing at once the necessity of keeping the machines running, since idle machines meant that the overhead was not being earned. As it seemed to be poor policy to upset the market for the staple article, selling prices were held in line with those of competitors, but sales efforts were greatly increased and the management did everything possible to secure other work for the machines. Work was taken at any price which would pay for labor, material and part of the overhead. Some very strange articles were manufactured, and due to the great interest shown by everyone in the organization costs frequently fell below the estimates so that more of the burden was earned than had been expected. The net results were that wages were not reduced, no employee lost his position and a small profit was made for the year. This last item was particularly noteworthy as the plant was the only one in its line to make any profit that particular year.

These instances seem to indicate that it is good policy to have an average overhead rate based upon normal operations and during dull periods to take any work which will earn part of the overhead. —C. J. Morrison.

How Can I Regain "Dull Time" Overhead?

I don't think Bill Holland did a job of clear thinking when he sent a copy of Frank Whittaker's letter to the correspondent who asked Bill how to figure overhead.

I admire Whittaker's wisdom in selling his machines at a good price, based on what they will do for their owners. I admire his more than average wisdom in taking as a guide for his pricing, the average overhead for a number of years. That is bound to help in every case, no matter what basis of distribution may be used in applying it to cost. I also admire Whittaker's much more than average wisdom in realizing that overhead is not made any less by doing work at or below the normal cost. But for me Whittaker's letter shows about average unwisdom in two particulars that Bill Holland should have disapproved if he knew what he was talking about.

The first is in taking special jobs in dull times at a loss, in order to hold his gang together. Who makes these special jobs in active times? What becomes of their gang when Whittaker takes these special jobs presumably below their regular prices? How would Whittaker like it if these other people were to offer some of Whittaker's standard lines below his regular price in dull times, to hold their gang together? How does he feel in the dull times, when his normal competitors take orders for standard machines without profit, in the attempt to get enough business away from him to be able to keep their gang together? Does he not think it is much worse for his competitors to do this on standard lines than it is for him to do the same thing on "special work?"

The second bad thing which Whittaker's letter shows, is that he is using a poor method of figuring overhead. For in spite of his more than average wisdom in some other things, he is one of those trustful souls content to figure overhead as a percentage of direct labor cost, and to think that this helps them in estimating, and in controlling the overhead itself.

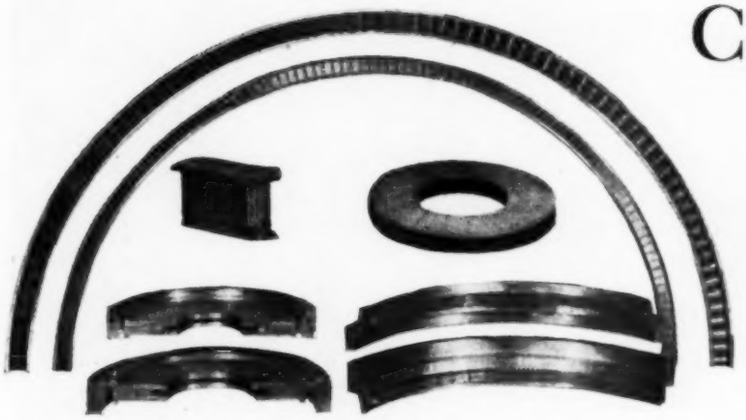
Of course many shops still use this method, but that is merely because their executives have not troubled their busy brains to learn a better one. But for this among other reasons, few machine businesses last much over twenty years, and over half of them do not last ten years. Many executives who do not know much about accounting are told by their accountants that this is a nice, simple, easy method for getting an overhead figure. Well, that is true. This method can be worked by any school boy who can do long division. But after the accountant has produced this figure, it is about as useful to the executive as a measure of overhead, as a rubber tape line would be for measuring thousandths of an inch.

The worst thing about this figure is that so many use it as a guide in making prices. Later on they wonder what's the matter with their business, and blame their troubles on "competition" as some mysterious thing that prevents them from making profits. Whittaker's method simply overcharges the overhead allotted to operations that require much direct labor aided by the use of inexpensive equipment, and undercharges for the operations done on large expensive machines. Then if he tries to sell those overcharged items at a price that will show a profit he may run up against a wiser competitor who knows his costs, and who quotes a lower price. Whittaker probably thinks that fellow is a rank price cutter. But when Whittaker offers the undercharged items he gets the business, and his wiser competitor knows very well that Whittaker is a price cutter.

If Whittaker is running much of a machine shop he has equipment of varying size and cost. He may be paying a skilled bench hand, working with $50 worth of equipment as much wages as he pays a skilled planer hand working with $15,000 worth of equipment. But evidently Whittaker has not yet recognized the necessity of charging each man's work its proportion of the cost of the capital factors he employs, as well as the wages the man gets. So on his supposed cost sheet he undercharges for planer work, and overcharges for bench work.

It seems to me that both Whittaker and Bill Holland need more education in figuring overhead —but so do many other managers, and consultants, and above all, so do all the accountants who influence managers to use the discredited "percentage of direct labor" method of figuring overhead.

—Ernest F. DuBrul.



Copper Brazing *in a* Hydrogenated Furnace

A Laboratory Process Just Made Available Commercially

BRAZING with copper, so as to secure a perfect alloy weld between surfaces that could only be united with difficulty by any other method, has recently been accomplished by the engineers of the General Electric Company through perfecting a design of electric furnace in which an atmosphere of hydrogen can be maintained at will. The presence of hydrogen in the furnace cleans the metals to be brazed and not only obviates the necessity of any flux but also insures the flowing of the copper used in brazing into the joints to be united. Nor is this all. The capillary attraction draws the fluid copper into the smallest crevice of the joints.

Special furnaces are of course necessary for the economical use of this method; otherwise it would be necessary to inclose the work in special containers into which hydrogen could be introduced. Two types of these special furnaces are shown in the accompanying illustrations, one a three-stage furnace, as in Fig. 1, and the other continuous, as in Fig. 2. In Fig. 1 the work is loaded in the front or open position, and the turntable moved to the left after the furnace covers have been raised. After the cover is lowered over the work the furnace is heated to about 1,100 deg. C., or 2,012 deg. F. Hydrogen, being lighter than air, remains in the cover while it is raised. This heat melts the copper that has been placed on the work near the joints and it flows into each joint and over the work itself near the joints. The entire surface can be covered with copper should it be desirable to do so. When the copper has been melted the covers are again lifted and the turntable moved to bring the brazed work under the cooling cover, and a new batch moves into the furnace. The cooling furnace or cover also contains hydrogen but is surrounded with water pipes so as to cool the work to atmospheric temperature. The hydrogen prevents the formation of oxides during the cooling process. In the continuous furnace, Fig. 2, the work to be brazed enters at one end, by an elevator in this case, passes through the long tubular furnace on a roller track, and is cooled when it reaches the other end. The heating coils or elements are in the end of the furnace where the work enters. Hydrogen gas is maintained the whole length of the tube so that the same effect is secured as in the furnace in Fig. 1, but the production is much more rapid.

It is difficult to realize how thoroughly the melted copper flows into the smallest crevice, and the example in Fig. 3 is of particular interest on that account. Here are a number of ground steel plates to form a steam table. The various parts are laid on the base plate and tacked by arc welding to hold them in place. The holes are drilled and all the plates riveted together. Then the copper wire for the joints is laid into the recesses as shown and the whole thing put into the hydrogenated furnace. When the proper temperature is reached the copper flows into every joint and between adjacent flat surfaces. In the riveted joints the copper fills any minute opening between the rivet and the plates and so produces a perfectly tight joint.

Another example of the uses of this method is in the

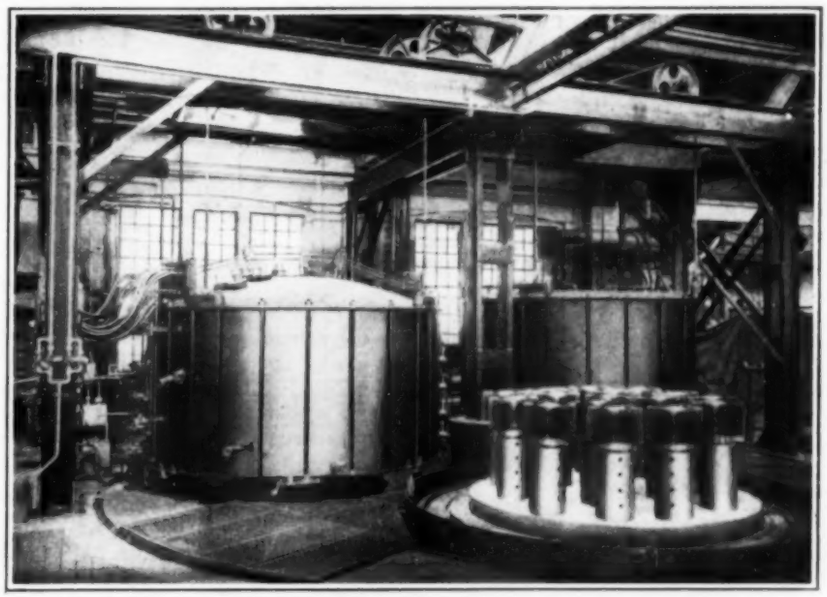


Fig. 1—A three-stage furnace used for hydrogen brazing. The base in the right foreground has just been loaded, that at the left is under the furnace cover with the heat on, that in the right background is under the cooling cover. The hoods are lifted when it is necessary to rotate the table, unload the finished pieces and introduce a new charge

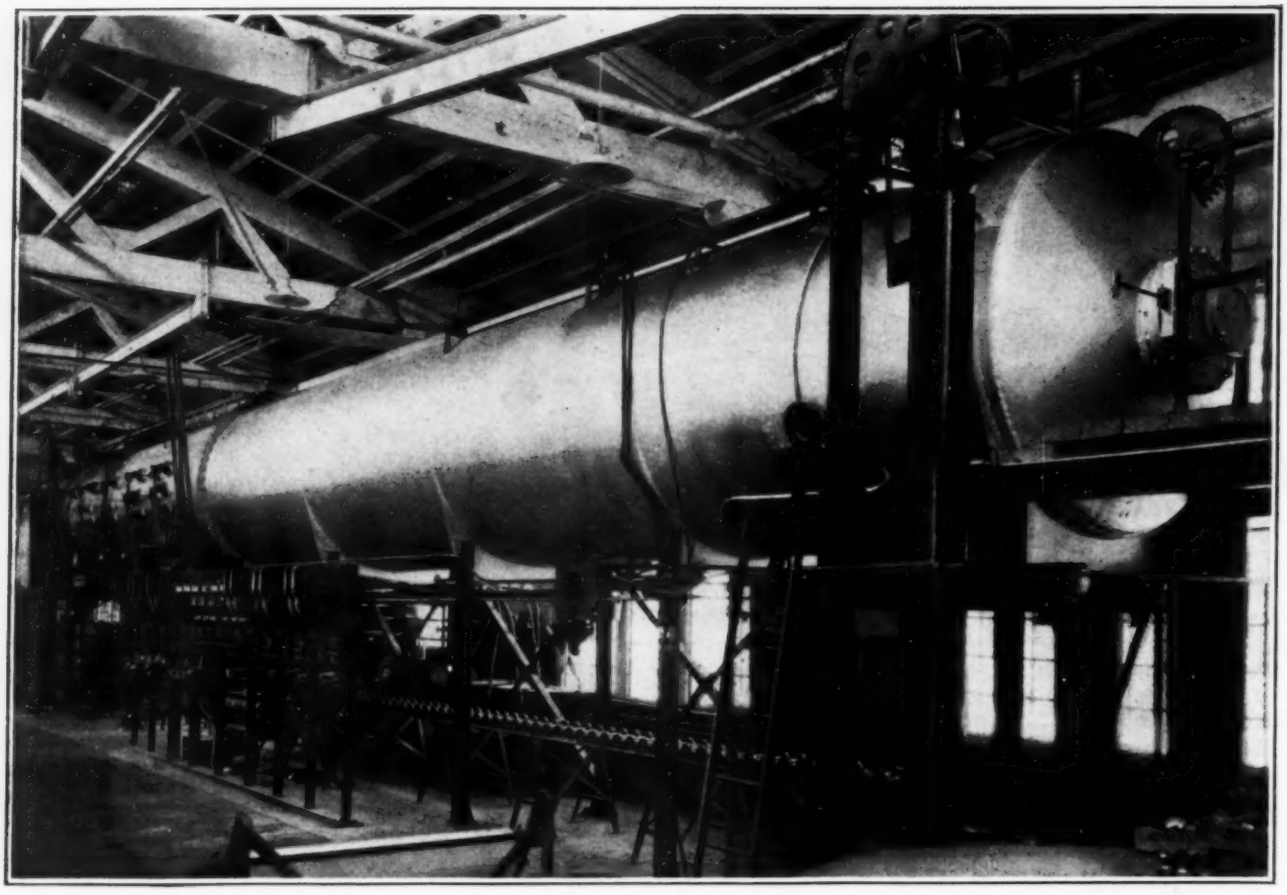


Fig. 2—A continuous furnace for hydrogen brazing, faster than the three-stage type. Work is introduced, by means of the elevator at the left, to the hot end of the furnace; travels along a roller track to the cooling chamber; and is lowered to the roller track beneath the cylinder by the elevator at the right

brazing of the blades into the turbine runner shown in the headpiece. Here the numerous blades are located and spaced by stampings that maintain their correct position. A suitable amount of copper is applied near the joints to be brazed and the work is placed in a furnace having the requisite amount of hydrogen. At the proper temperature the copper flows into every crevice, brazing the many separate pieces into a homogeneous whole. Instead of it being necessary to braze each joint separately and to run the risk of the heat affecting a joint already completed, this method permits the brazing of any number of joints simultaneously and insures a perfect union in each case.

The process of copper brazing in a hydrogenated atmosphere is a striking example of the possibilities to be secured by the co-operation of chemical, electrical and mechanical engineering. Without the electric furnace, as now developed, the practical applications of this method would not be available to the manufacturer. For while this process has been known to the laboratory and to the manufacturer of small, special equipment for some years, it was not available as an economical production process until the electrical engineers developed the furnace designs, and the mechanical engineers devised the methods of handling the material economically. Possibilities as to application of the method are almost endless.

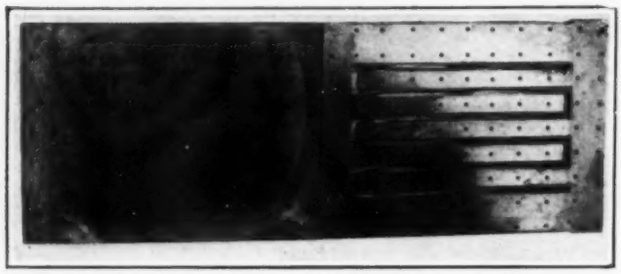


Fig. 3—Two halves of a steam plate ready for hydrogen brazing. The fluid copper enters every joint and makes the rivet holes absolutely tight

Railroads Increase Efficiency

By Norman F. Titus

IN THE field of railroading, a veritable revolution has taken place in the last five years. American railroads have achieved remarkable results in the improvement of their operations. During the period 1922 to 1927, the daily movement of freight cars has increased one-third; at the same time the amount of coal consumed has been reduced proportionately one-sixth. Furthermore, during this period, freight traffic increased one-third, whereas the number of employees increased but one-twelfth. No mention is now made of car shortages, as was formerly the case, but, instead, attention is called to high car surpluses. During this period revenue freight ton mileage increased from 372 billion ton-miles in 1922 to 478 billion ton-miles in 1927. Thus, with a tremendous increase in business on one hand, there have been introduced more highly efficient and economic practices on the other.

Equipment Makes Possible the Ford Model A

A Gasoline Tank That Serves Also as Cowl and Dashboard

By Fay Leone Faurote, M.E.

THE Ford Model A gasoline tank is unique in that it serves three purposes. Besides performing its regular function as a fuel reservoir it forms the cowl of the car and acts as a dashboard and instrument board. Furthermore, by this location it is possible for the gasoline gage to be directly operated and in the most convenient position for continuous inspection. The tank, with its filler cap just in front of the windshield, can be seen on the completed car featured in the headpiece above.

The Ford Model A tank holds ten gallons. It is made of No. 18 U.S.S. GA. (0.049–0.051) terne plate. The specifications call for full cold-rolled, low-carbon open-hearth auto-body stock, free from waves and pit marks, coating to be not less than 12 lb. per thousand sq.ft. of surface, coating to contain not less than 16 per cent tin.

The manufacture of the tank is interesting for two reasons: First, because of the extra deep drawing required; and second, because of the fine seam-welding job that must be done to make the tank thoroughly tight.

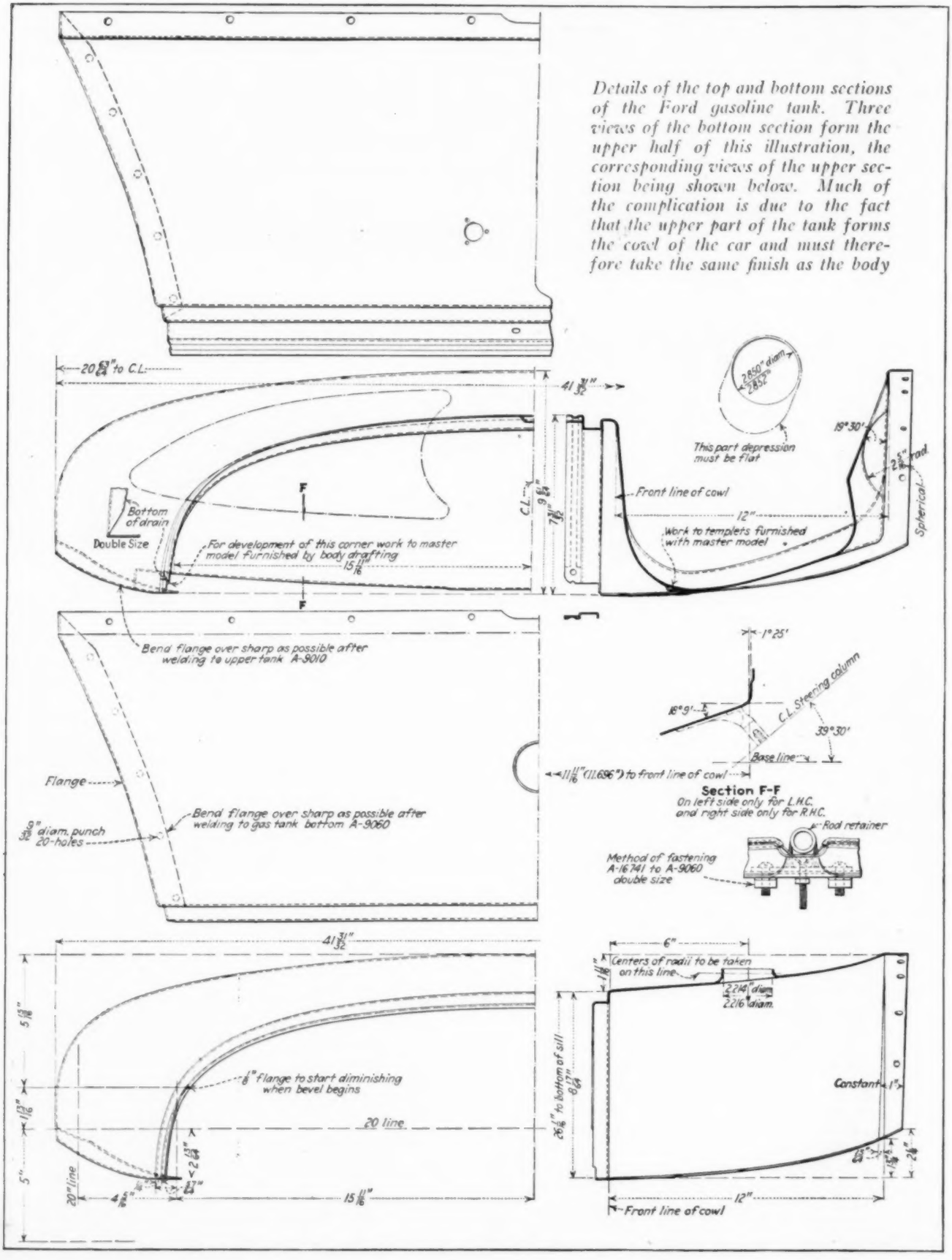
There are two main sections: the top section and the bottom section. Nine operations are necessary to fabricate the tank top. They are:

No.	Operation	Machine	No. per Hr.
1	Rough Blank	272 Stoll Shear	400
2	Roll	54 in. Roller Leveller	300
3	Draw	407-D Bliss	100
4	Trim and pierce for filler top	7-D Bliss	300
5	Emboss filler hole	P-3 Ferracute	400
6	Restrike and finish L. H. end	PA-4 Ferracute	400
7	Restrike and finish R. H. end	PA-4 Ferracute	400
8	Flange both ends	93½ Toledo	250
9	Spotface	21-in. Sibley	400

The forming of the tank bottom requires thirteen operations. Starting with the rough blanking on a Stoll shear which handles 190 an hr., the parts pass over a Ford oiling roll to the first and second draws performed on No. 410 Bliss presses at the rate of 200 an hr. The roughly formed tank bottoms are then given a finish trim on a 93½ Toledo press (250 an hr.); a restrike and flanging operation on a 155-D Cleveland press, followed by the piercing of two ¼-in. holes and three elongated holes on a 203-B Toledo. The succeeding operations are:

No.	Operation	Machine	No. per Hour
8	Emboss for cable support clearance	93½ Toledo	200
9	Crown face of gas tank (rear)	8-A Bliss	200
10	Start flange	166½-D Bliss Press	200
11	Pierce (1) 2.850-in. gasoline gage hole	PA-3 Ferracute	300
12	Restrike Bottom	93½-E Toledo	250
13	(4) $\frac{13}{64}$ holes steering columns bracket (3) $\frac{11}{64}$ holes outlet (2) $\frac{13}{64}$ holes choke bracket	93½ Toledo Press	250

The first operation of the assembly is the pressing in of the filler nipple; the next three are riveting operations, attaching the outlet, steering column reinforcement and choke bracket. Both ends of the bottom flange are then notched for anti-rattler wire. The sixth operation is the spinning in a fixture to assemble the gasoline gage casting to the tank bottom. The seventh involves the spot welding of twelve spots on a Ford welder and the fastening of the cable support to the tank bottom with a Taylor welder. Both of these operations are performed at the rate of 140 pieces per hour.


Details of the top and bottom sections of the Ford gasoline tank. Three views of the bottom section form the upper half of this illustration, the corresponding views of the upper section being shown below. Much of the complication is due to the fact that the upper part of the tank forms the cowl of the car and must therefore take the same finish as the body
20 3/64" to C.L.
41 31/32"
2.850" diam
2.852"
This part depression must be flat
19°30'
2 3/4" rad
Spherical
Front line of cowl
12"
Work to templets furnished with master model
Bottom of drain
Double Size
For development of this corner work to master model furnished by body drafting
15 11/16
C.L.
9 5/8"
7 7/8"
F
Bend flange over sharp as possible after welding to upper tank A-9010
1°25'
18°9'
C.L. Steering column
39°30'
Base line
11 11/16" (11.696") to front line of cowl
Section F-F
On left side only for L.H.C. and right side only for R.H.C.
Flange
9/32" diam. punch 20-holes
Bend flange over sharp as possible after welding to gas tank bottom A-9060
Rod retainer
Method of fastening A-16741 to A-9060 double size
41 31/32"
5 15/16"
1 13/16"
5"
1/8" flange to start diminishing when bevel begins
20 line
20" line
2 23/64"
4 5/16"
15 11/16"
6"
Centers of radii to be taken on this line
1/16"
2.214" diam
2.216" diam
26 1/16" to bottom of sill
8 17/32"
Constant 1"
1 5/8"
2 1/4"
12"
Front line of cowl

The splash plates are then welded to the bottom by another Ford welder after which one man solders the fourteen spot welds on the cable support, splash plate and steering control support, also all rivet and casting, choke bracket, outlet, steering column support, castings. This is followed by another hand operation: bumping. The components are then washed in a Niagara washer at the rate of 300 an hr., after which top and bottom are put in a die and the flanges restruck in a 6-D press, handling 200 an hour.

Two men then clamp the top and bottom sections together and on a Winfield welder spot weld, with seven spots, these top and bottom sections. The three clamps are then taken off and the whole job seam-welded on a Gibb seam welder, each machine handling eight an hr. This is a nice job and not so easy as it looks. The tanks are then tested for leaks after which eleven succeeding minor operations are performed as follows:

No.	Operations	Machine	No. per Hour
20	Finish flange and top and bottom	166½-D Bliss	200
21	Restrike R. H. end	PA-4 Ferracute	250
22	Pierce R. H. end flange (5) $\frac{9}{32}$ holes	PA-4 Ferracute	250
23	Restrike L. H. end	PA-4 Ferracute	250
24	Pierce L. H. end flange (5) $\frac{9}{32}$ holes	CA-4 Ferracute	250
25	Pierce (10) $\frac{9}{32}$ holes in rear flange	23-C Bliss	100
26	Test for leaks	Tank	40 each
27	Bumping	Hand operation	
28	Clamp upper dash to tank and line up	Hand operation	100
29	Spot weld upper dash to tank	Taylor Spot Welder	80
30	Final test for leaks in water	Tanks	30 each

Following the customary Ford practice the presses and welding machines are closely grouped and so set that the work can be easily passed either across rollers or by conveyor from one machine to the next as the work progresses.

Two Troubles Developed

When it came to actually making this Ford tank two troubles developed. The seam welder would not make a perfect seam-weld. The terne plate was burned at some points; at others it was not sufficiently heated to weld. The standard seam welding machine, although expected to do the job, did not do it. Obviously something had to be done or the tank redesigned. The engineers soon found, however, that the trouble arose from the fact that the flow of current was not constant, that alternating spots of burnt metal and spots not sufficiently heated were caused by momentary peaks and depressions. Furthermore, terne plate is mean metal to handle. Since it burns more easily than ordinary stock, especially if its surface is rough or not properly cleaned, more care than ever had to be taken to do this water-tight job well.

As the result of the study it was decided to redesign the welder. The transformer was enlarged; the copper welding-disk arms were shortened; Ford-type electrodes, which are said to give superior current efficiency, were installed; the bearing in which the welding spindle ran was altered and mercury introduced; and a Ford-type interrupter, which cuts the welding current 360 times a minute as a minimum, thus preventing the burning of stock under all ordinary circumstances, was put in place of a less efficient standard unit used for that purpose. The new machine is at work today, doing the job well. In fact there are ten of these Ford-special-redesigned electric seam welders now at work on the Model A tank job, turning out more than 2,500 perfect tanks per day.

Who Pays the Cost of Price Cutting?
Discussion

By Edward L. Johnson
Purchasing Agent, Black & Decker Manufacturing Company

IN ESTABLISHING purchasing principles for this company, we have strongly adhered to the policy that the supplier of any commodity we use is entitled to a fair margin of profit. Furthermore, we have always paid considerable attention to the sources of supply with whom we deal, making special efforts to cultivate friendship and good will. We have not confined this practice to sales forces alone, but, by frequent plant visitations, have made the acquaintenances of factory organizations, whom we consider the men behind the guns. In other words, we look upon our main sources of supply as departments of our own business.

If a purchaser knows the commodities that he is buying and the factories producing them, he knows when he has prices that are in keeping with production costs and a fair amount of gross profit. Such a manufacturer does not find it necessary to follow the practice of securing competitive bids on a wholesale scale. For example, when we feel that the price of a commodity which we have been buying from an old source of supply is too high, considering market conditions, we take the question up immediately with this source, rather than go out after competitive bids and remove the business to a new source. In such cases, we very often visit the plant of the seller, at which time cost figures are gone over, and usually an agreement is reached that is satisfactory to both parties. Our suppliers welcome this policy, as they realize that we are willing to work along with them. We often help them by suggesting different means of handling and routing our work and by increasing schedules, so as to enable them to buy or contract for raw materials in larger quantities. These methods have generally resulted in economies to us as a purchaser without affecting the gross profits of the sellers. As a result, in many cases, we have been dealing with the same companies for a period of ten years and more, and we have found that no business relations can be profitable unless both parties reap benefits from the transactions.

Manufacturers who deliberately cut their prices to secure business, I believe, are buying business, with no profit to themselves, and will be headed inevitably toward receivership. The successful manufacturing plant must, in figuring its prices, take into consideration material costs, labor costs and factory overhead, as well as general sales and administrative expenses. In the final analysis, the officers of any company are entrusted with the stockholders' money which they must invest profitably, and unless they give the proper consideration to this fact and can show a certain percentage of profit on each sale, they can never hope to build up a healthy financial condition within their organization.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Monthly Checks on Workman's Ability

"SEEN Williams' latest notion, Al? That card to be filled out once a month by us foremen for every man in our gang."

"Sure, Ed. Got a bunch this morning. Thought it was a laundry list 'till I began to read 'education, special knowledge, tact, honesty, reliability, appearance, promptness,' and so on. Knew we didn't send things like that to the Chinaman's."

"Well, it sort of gets my goat, Al. I've got plenty to do without filling out a bunch of cards every month."

"I agree, Ed, that I think he's put too many things on the list. Don't know how I'm going to check such things as 'energy, assertiveness, persistence and initiative,' not to mention a lot more. But the idea strikes me as O.K. if he'd pick about ten items instead of thirty."

"But what's the use of it anyhow, Al?"

"Several uses, Ed. Puts a record of the men in the super's office so he can have a better chance to pick men for promotion. Then, too, it sort of checks up on our ability to judge men, and our honesty as well."

"Just how does that come in, Al?"

"We're all human, Ed. And if Williams asked me today who was the best man to pick for a new job I might be biased by some recent happening. Take Jake Lewis, for example. He's always been a good man in every way—reliable and a good worker. But lately he's been off-color quite a bit. Maybe sickness at home—a quarrel with the missus—or hunting a new job.

"If Williams asked me about him today he wouldn't get a very good report, but if we'd had these cards for the past year he'd have stood ace-high on them all. I ought to find out what ails him, and I will before I fill out his card. But if Williams had a year's cards that were O.K. he wouldn't be dependent on my present report about the man."

"Well, if he isn't any good now, isn't that all that counts, Al?"

"We all have our off-days, Ed. Likewise we all have short memories. And we are apt to fire a man, or recommend him for promotion on what happens at the moment. These cards will give Williams a chance to check up the past also. He can run over a few cards and see whether a man has been consistently good along any one line, or different lines."

"I can't see anything but a lot more work, Al. And I don't see how these cards are going to help much, anyhow."

Is Al right in feeling that these cards may help Williams pick the right men? And that the system checks up the foremen's ability to judge men? Or how much he is influenced by present happenings, forgetting the past?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Putting Color on the Machine Tools

BLACK is not a shade which is generally associated with cleanliness. When the machines in the shop are all painted black, it gives the shop a somber and dark appearance that tends to hide dirt. On the same principle that white corners on dark stairways cause them to be kept clean, so more pleasing colors will produce the same effect on machines. It is not necessary to use bright, flashing colors, but the selection of a neutral color, such as light gray, buff, or even a dark green, will brighten up the shop. Due consideration must be given to the effect of oil and grease.

To the man who has worked all his life in a dark, gloomy shop, one in which the colors are varied and pleasing will be a distinct relief and an incentive. Such an innovation shows an active interest in the workmen on the part of the management, and it cannot fail to strike a responsive chord. The increased amount of light available will be surprising, which is in itself conducive to high-quality work, while it is an undisputed fact that production will be increased thereby.—J. W. GARDINER.

Is the Kicker Always a Nuisance?

TWO frogs, in their investigation around the springhouse, fell into a milk-can. One of them said, "Well, it's no use kicking here as it would simply be folly." The other one said, "Well, I'm going to kick anyway." The can was sent to the city, and when uncovered in the morning, there was one frog sitting on a lump of butter singing, and the other was found on the bottom of the can, dead. Did it pay to kick? Is it not possible that the man who does not kick against improper conditions will fade out of the picture when his shiftlessness has become known? —G. M. RICHARDS.

He Never Asks for a Raise

I CAN hardly agree with F. J. Schimpf that the man who gets a new job rather than ask for a raise is lacking backbone. He may not display good judgment but it certainly takes more backbone to quit a job he knows and tackle a new job than to ask the boss for a raise.

This kind of a man is almost an exact counterpart of a boss I knew years ago. He always fired any man who asked for a raise. His theory was that if the man was worth more he would pay it without waiting to be asked. If he hadn't raised him, he wasn't worth it. If he asked for a raise he was dissatisfied, and he didn't want a dissatisfied man in the shop. He, too, lacked good judgment but not backbone, because he lost a lot of good men by sticking to his theory. —CHESTER H. FRANKLIN.

THE · NEXT · TOPIC

Should He Report Another's Error?

ADVANCE QUESTIONS

A foreman finds an expensive tool belonging to another department in the scrap because the man using it thought he had broken it. Should he report it, or use it in his department? Al and Ed present different viewpoints.

Something Besides the Pay Envelope

THAT the pay envelope is the biggest factor in the interest of the men, I think we will all agree. Very often, however, the small contributing factors are also important in keeping interest alive. It is in the light of a helpful contributing factor that I look upon Williams "shop news."

If Williams can resist the impulse to use his shop paper as a medium for preaching to the men or for putting over the management's attitude on controversial points, he can easily make this publication a source of a great deal of interest. It should tell the men of the products made or the machines they have built, the distant points to which they are shipped, the customer's endorsements of the machines, and personal facts about individuals, but "kidding" should be avoided. If possible, it is well to invite the men to contribute articles concerning unusual set-ups, special tools, and peculiar details of their work. —E. R. MILLER, JR.

Getting the Wear Out of Machines

ALTHOUGH Williams is correct in using the highest economical speed of his machines, there is a probability that the workmen will go beyond reasonable limits, so that direct damage to the alignment of the machines results. Every shop has machines which have to be nursed past a certain point, or on certain operations, because some one has taken too heavy a cut. They are all right for average conditions, but there is a content vigilance necessary to warn a new operator of their bad features to avoid spoiled work. Therefore, if high speeds are to be adopted, be sure that those who use the machines have a set of regulations covering the new speeds desired for the various operations.

—CARL SCHULTZ.

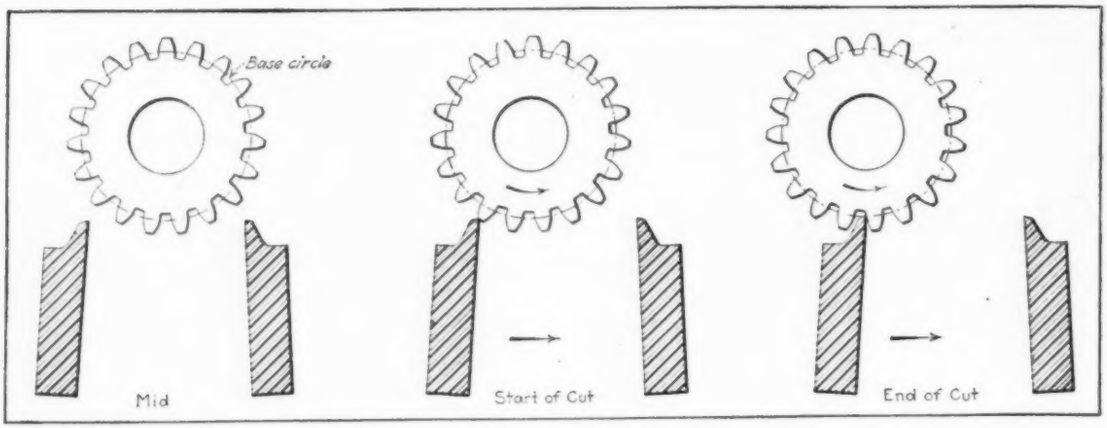


Fig. 1—Relative position of the tools and the gear at different parts of the cycle

A New Process of Finishing Gear Teeth

By Ellsworth Sheldon

New England Editor, American Machinist

A PROCESS of finishing the teeth of unhardened gears in exact conformity with the theoretically correct involute curve has been developed by the Pratt & Whitney Company, Hartford, Conn., and embodied in a machine that is practically automatic in its operation, requiring no attention after being set up for a specific type of gear except to put in the work and start the cycle in action. The machine is designed to operate only upon spur gears 2 in. and less in face width, from $1\frac{3}{4}$ to 7 in. pitch diameter, having from 12 to 50 teeth, of 4 D.P. and finer, and of any desired pressure angle.

As its name implies, the function of the machine is to remove—by shaving—a very small amount of material from the tooth faces and flanks of gears within the above limits that have already been cut by any of the standard processes, in order to insure the uniformity and accuracy of contour necessary to quiet running and smooth transmission of power under all conditions of load.

As the involute curve is generated by the end of a theoretical line unwinding from an imaginary generating circle, so in the machine the final tooth profile is evolved by a single wide shaving tool (the edge of which may be considered to represent the end of the unwinding line) traveling past the rotating gear in a plane tangent to the base circle of the latter and sweeping into contact with that circle in its passage, thus producing the profile in a single cut parallel to the involute instead of a large number of perpendicular cuts.

In reducing this principle to practice the rotative movement of the gear becomes intermittent, or oscillatory, while the tool reciprocates. Advantage is taken of the reverse movement to apply a second tool to an opposite profile, thus shaving the equivalent of one tooth for each complete movement, forward and back, of the gear and tools. The line drawing, Fig. 1, shows the relative positions at different parts of the cycle.

When the tool-carrying slide is in mid-stroke—incidentally, the loading position of the machine—the relation will be as shown at the left. Set in motion in the direction indicated by the arrows, the left-hand tool engages a tooth at the circumference of the gear and passes down its face and flank, removing a thin shaving of metal as it does so, until it coincides with the base circle of the gear as at the right. At this point the movement reverses and the right-hand tool is brought into action upon an opposite profile soon after the slide has passed mid-stroke on its way to the left.

In the machine the gear is held in a spindle which

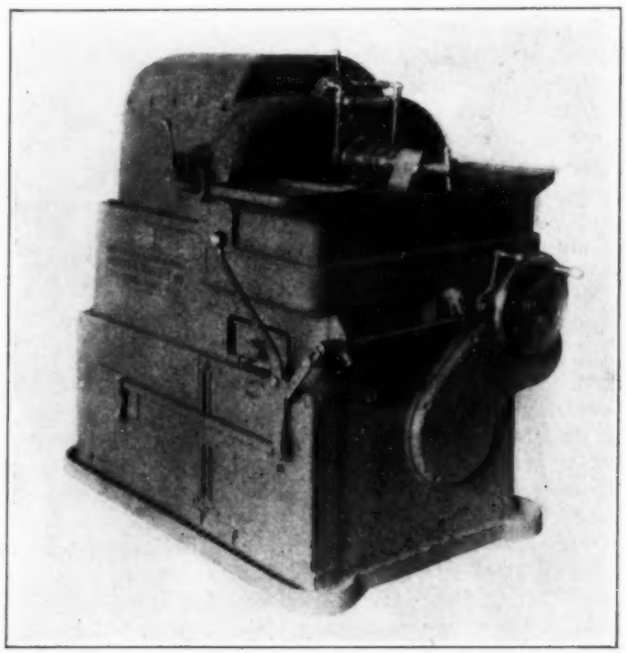


Fig. 2—Front view of machine with cluster gear in position

oscillates continuously, and the tool-carrying slide passes back and forth beneath it as if it were moved by a rack in mesh with the gear itself. No gears or racks, however, are involved in the movement; it is brought about by a carefully calculated and accurately formed double involute cam, secured to the spindle immediately behind the gear and acting upon opposed rolls held in housings that are a part of the main slide. The two involute curves comprising the contour of the cam are generated from a base circle coincident in diameter to that of the gear upon which the work is being done.

The reciprocation is quite rapid. Though each double movement completes the work upon the equivalent of one tooth of the gear, there is no pause at either end of the

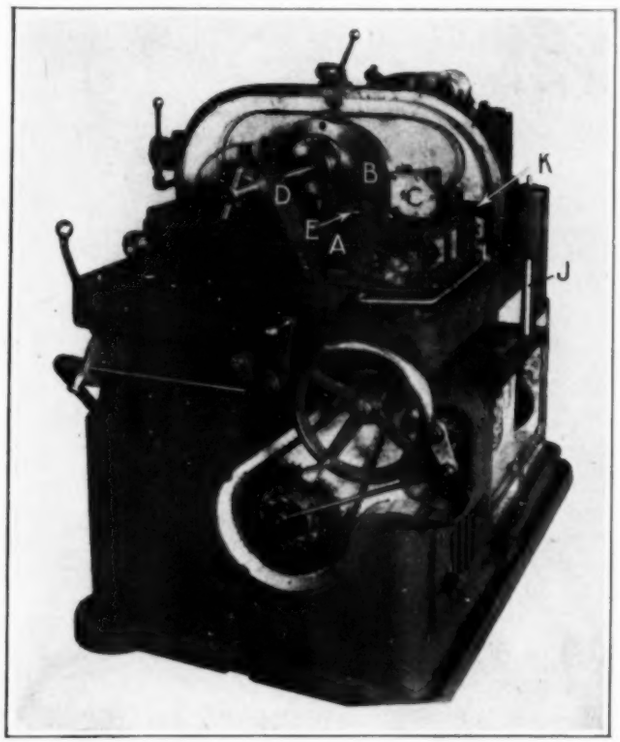


Fig. 3—Front view of machine with guards removed

stroke. As the first tool is advancing to its second cut the gear is automatically indexed to present another tooth, so that during each successive double movement both tools have engaged an unshaved tooth until every tooth has been covered. The gear therefore makes a complete, though intermittent, turn upon its own axis, independently of its oscillatory motion, while the machine makes the number of double strokes indicated by the number of teeth in the gear.

Nor does this complete the cycle. Without interruption of the continuous reciprocating movement the relative positions of the shaving tools upon the main slide are changed, so that as the gear makes its second intermittent (indexing) rotation a second cut is taken over both sides of each tooth. This is followed by a third and a fourth cut of successively diminishing thickness, so that not until the gear has made four full turns about its own axis is the work completed and the cycle thrown out of action.

Gears to be shaved by this machine may be cut by the hobbing, milling or shaping processes, but with a specially shaped hob or cutter upon which the teeth—corresponding to the spaces of the gear—are widened slightly

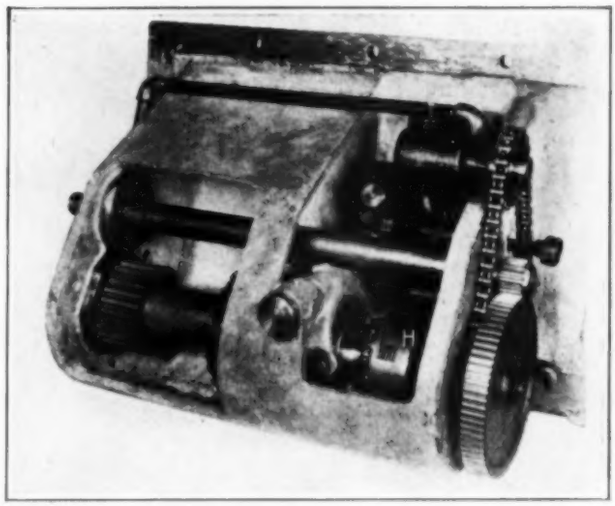


Fig. 4—The driving and speed change unit

at the point to undercut the flanks of the gear teeth near the fillet so that they will be below the theoretical involute curve of the finished gear. This procedure is necessary in order to provide an overrun for the shaving tools, otherwise the chip would remain attached to the tooth flank, or, if broken off, would leave a slight shoulder to interfere with the action of mating teeth.

The preliminary cutting is calculated to leave about 0.004 in. of material upon the face and flank of each tooth —corresponding to an excess tooth thickness of 0.008 in. —to be removed by the shaving tools. This amount is not arbitrary, but to secure best results should be adhered to as closely as is conveniently possible. During the first of the four intermittent rotations made by the gear the shaving tools will remove from the face and flank of each tooth any material in excess of this amount. The tools are then advanced with relation to the main slide a distance of 0.002 in. each, and shavings of this thickness are taken off both sides of the teeth while the gear makes its second indexing rotation. The tools are again advanced 0.001 in. for the third and another 0.001 in. for the fourth turn of the gear, upon completion of which the tools return to first position and the cycle stops.

The machine operates upon plain bored gears, clusters, and stem gears; a slightly different method of holding being required for each. The double involute cam that actuates the movement of the main slide must correspond to the diameter of the base circle of the gear being shaved. The index plate must be changed in accordance with the number of teeth in the gear. The range of oscillation is adjusted to suit the pitch and corresponding length of tooth.

A comprehensive view of the machine with a cluster gear in the work spindle is presented in Fig. 2, showing the operating position and the controls. The long lever to the left stops and starts the machine. Moved in one direction it actuates a multiple disk clutch to engage the mechanism with a constantly running motor concealed in the cabinet base. Moved in the opposite direction it acts upon a similar clutch, one member of which is fixed to the machine base, to bring the mechanism quickly to rest.

Adjacent to the handwheel to be seen on the front of the machine is a crank-lever to operate a device to locate the gear to be shaved in correct relation to the shaving tools when setting it into the machine. This device, which will be described in due course, can be engaged only when the machine is at rest, hence a double inter-

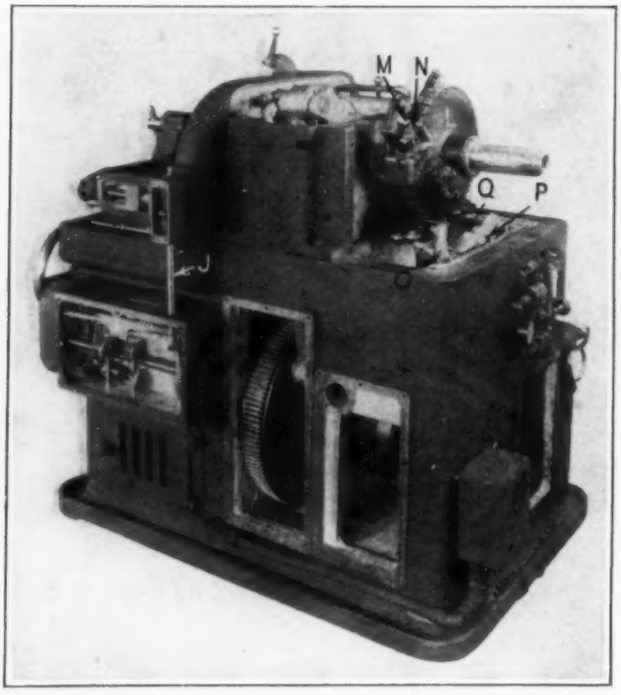


Fig. 5—Left side, showing indexing mechanism

lock—to be seen near the fulcrum of the starting lever—is introduced for the purpose of preventing movement of the crank-lever when the machine is running or of the starting lever when the setting device is in engagement with a gear.

The handwheel is connected to the main shaft of the machine by a chain and sprocket, the latter being mounted upon a non-reversible friction ratchet which allows the handwheel to remain stationary while the machine is running under power, yet in position to turn the machine forward at any time when it is at rest. There is no provision to turn the machine backward, and none is needed.

The small lever on the left side controls a poppet air valve to operate the pneumatic chucking mechanism, and another small lever to be seen on top of the machine regulates the supply of cutting oil or compound to the tools. When running, there is no visible part of the machine in motion except the gear upon which the tools are at work and the reciprocating slide beneath it. The moving parts are almost entirely covered by aluminum guards that are easily removable to provide access to the mechanism.

The front of the machine is shown in Fig. 3 from a different angle, with all of the covers and guards removed. The rectangular frame *A* is the main tool-carrying slide. It moves in a horizontal plane only, in a direction perpendicular to the work-carrying spindle and arbor to be seen above it. It has no other movement or adjustment. Part *B* is the double involute cam, attached to and oscillating with the outer member of the work-spindle. At *C* is one of the housings to carry the cam rolls; the opposite one being hidden in this view by the bracket *D*. Both housings are attached to the main slide and are so adjusted with relation to the involute cam that there can be no lost motion of the slide in whatever position the cam is presented to the rolls.

Mounted upon and moving with the main slide are two auxiliary slides, one of which may be seen at *E*, movable to and from each other in a direction parallel to the line of travel of the main slide. These are the tool carriers, and are actuated in their independent movement by stepped cams keyed to transverse shafts that are carried in bearings in opposite ends of the main slide and terminating in the sprockets to be seen on the front of the slide. The cams themselves are not visible. A periodic movement is imparted to one of these shafts—the one to the right—and is transmittel through the chain and sprockets to the other, causing the stepped cams to move the tool carriers toward each other. This movement takes place only upon the completion of each full indexing turn of the gear being shaved, and is the feeding movement for the second, third and fourth cuts over the gear teeth.

A timing box is located in the cabinet of the machine behind and below the handwheel. It is operated through a ratchet and pawl, to be seen in Fig. 3, from an adjustable-throw crankpin in the end of the main drive shaft of the machine. Its duty is to set the time at which to feed the tools to successive cuts and return them to the starting position, and to throw the cycle out of action upon completion of the work. Its mechanism will be shown more fully in another view.

In Fig. 4 may be seen a removable unit containing the gears and clutches through which the driving power is transmitted to the machine; and also two pumps, one of which delivers lubricating oil to all principal bearings of the machine under a pressure of 15 lb. per sq.in., and the other supplies cutting oil or compound to the tools. The position occupied by the unit is the lower left-hand corner of the machine as shown in Fig. 2; the rectangular plate to be seen at that point being, in fact, the front plate of this unit. Immediately in front of it and in line with its upper shaft is the driving motor,

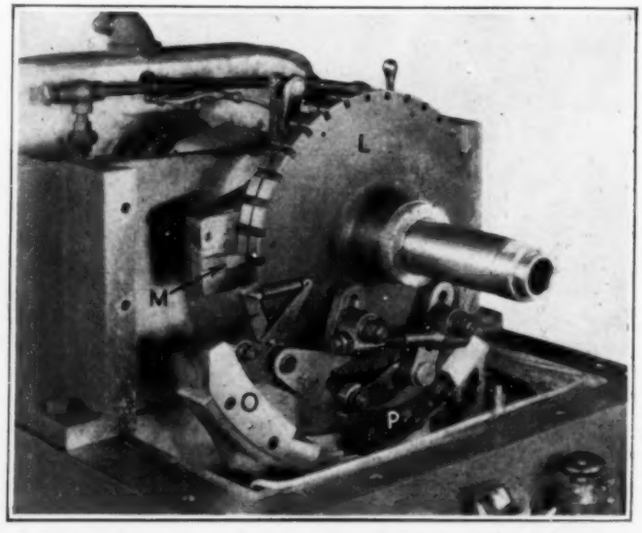


Fig. 6—A closer view of the indexing mechanism

which is connected to the end of the shaft by a compensating coupling.

On the opposite end of the unit is a pair of change gears, the ratio of which determines the speed of the machine. At *H* is the multiple-disk starting clutch, and partly to be seen behind the partition at the middle of the box is the clutch that acts as a brake to stop the machine. The pinion to the left on the lower shaft meshes with the large gear to be seen in Fig. 5, which is on the main driving shaft of the machine.

On the face of this gear is an adjustable-throw crankpin that transmits through a connecting rod—the upper

and lower ends of which are visible in Fig. 5—a rocking motion to a lever that is permanently secured to the outer sleeve of the work-carrying spindle, thus causing the spindle to oscillate through a range that is variable by changing the radial setting of the crankpin. Timken bearings are provided at both ends of the duralumin connecting rod.

To the left in Fig. 5 is the timing box. The ratchet at the opposite end of the box—to be seen in Fig. 3—is interchangeable with others and must have the same number of teeth as the gear being worked upon. At the end of each double stroke of the main slide, corresponding to one turn of the main driving shaft and also to the work upon one tooth of the gear, the ratchet is stepped forward one notch. As the gear being shaved indexes one tooth at the end of each double stroke of the slide it follows that it and the ratchet shaft complete a rotation at the same time.

The final movement of the ratchet shaft, acting upon the vertical shaft *J*—Figs. 5 and 3—through cams, swings a lever—*K*, Fig. 3 only—into position to contact with a star-wheel that is keyed to the inner end of the transverse camshaft in the slide. Since the star-wheel and shaft moves with the reciprocating slide, the result of the momentary interference with it of lever *K* is to cause the transverse shaft to make a part turn equal to one tooth of the star-wheel.

On the shaft, and also upon the shaft at the opposite end of the slide, is a four-step cam. The part turn of the shafts, taking place coincident with the final indexing movement of the gear being shaved, moves both tool carriers toward the middle of the slide 0.002 in. or 0.001 in., as the case may be, or returns them to starting position according to the stage to which the cycle has progressed. A reducing train of gears in the timing box operates to throw the cycle out of action and stop the machine upon completion of the fourth stage, which is coincident with the return of the tools to starting position.

The work-carrying spindle is in two concentric parts, the outer member, or sleeve, being oscillated continuously. The inner member—also hollow, to admit a drawbar—takes two of its three bearings within the oscillating sleeve. Midway of the length of the inner member—which is the spindle proper—and close to the end of the oscillating sleeve is the index plate *L*, Fig. 6, securely, though interchangeably, mounted upon a tapered seat and keyed in place.

Permanently secured to the end of the sleeve is a sector in which is mounted the radially-sliding lockbolt

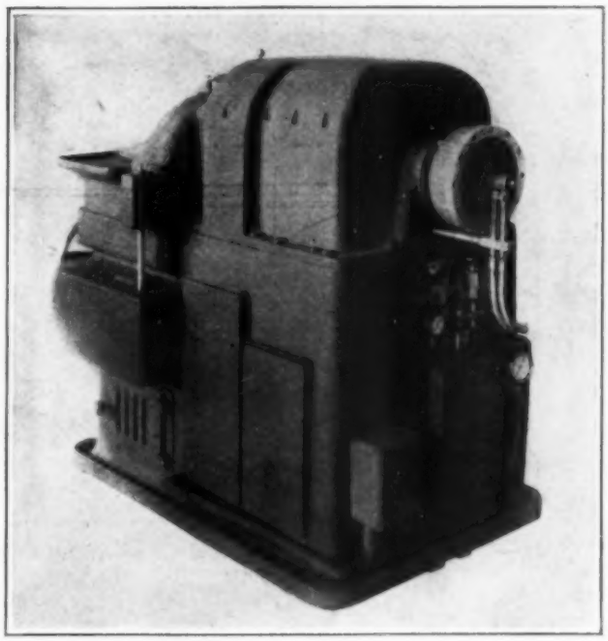
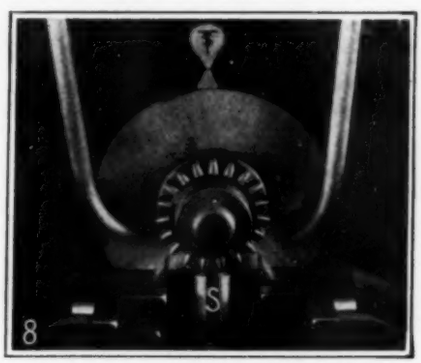


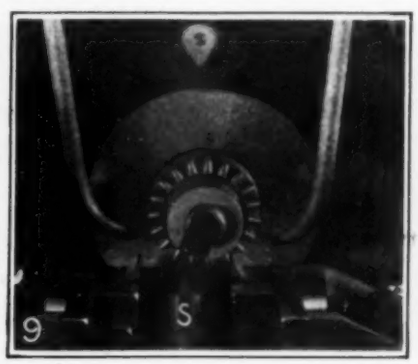
Fig. 7—Rear view, showing air cylinder

M and upon which cam levers to actuate it and the pawl *N* are fulcrumed. The pawl is actually carried by a free lever so connected by links that it has an independent movement sufficient to cover the longest distance between notches of any index plate, but normally oscillating with the other parts. When the lockbolt is engaged with the index plate the spindle and sleeve oscillate as a unit.

The lockbolt and pawl are actuated independently, though of necessity in definite relation, by the stationary cams *O*, *P* and *Q* (*Q* is hidden in Fig. 6), which are carried on the end of a transversely swinging lever that moves periodically to bring the cams into the paths of the moving rolls or swings them out of the way to allow the rolls to pass without interference. In Fig. 5 a cylindrical cam may be seen through the opening to the right in the base of the machine. This cam rotates with the main shaft and moves the swinging lever and cams *O*, *P* and *Q* sidewise, forward and back, upon each double stroke of the machine.

The cycle is as follows. When the oscillating sleeve rolls over to the left—counterclockwise as here shown—cams *O*, *P* and *Q* are in the position shown in Fig. 5 and the moving rolls do not touch them in passing. At the instant of reversal the lever moves sidewise to bring





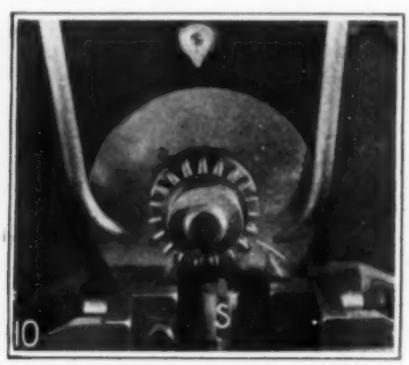


Fig. 8—It is essential to set in the gears in exact relation to the shaving tools. This view shows the locating plug in engagment. Fig. 9—The locating plug must be withdrawn before the machine can be started. This view shows the right hand tool in engagement with the top of a tooth to start its cut. Fig. 10—The slide moving in reverse direction to bring the left hand tool into action. The plunger S is actuated by a crank handle

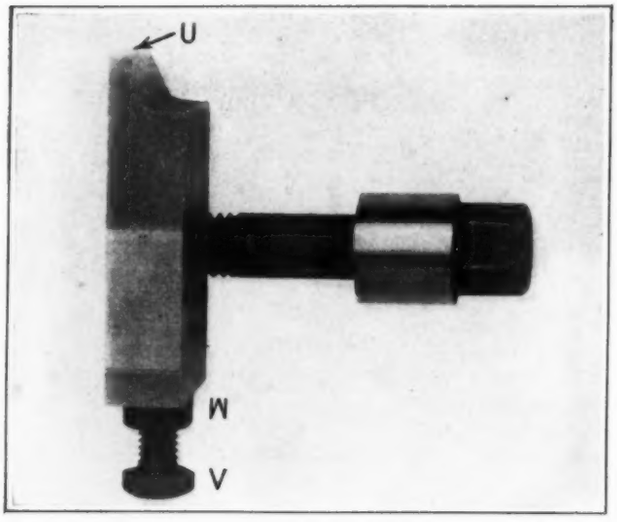


Fig. 11—One of the shaving tools and its attaching and adjusting bolts

the cams into the paths of the rolls as in Fig. 6; the result being that the lockbolt *M* is withdrawn from the index plate while the pawl, under the influence of its cam, lags behind, so that when the movement has reached mid-position and the rolls run off the ends of their respective cams the index plate has fallen one notch behind its previous position. The indexing takes place during the first half of the stroke in one direction only, and there is no relative movement between the inner and outer members of the work-carrying spindle during the latter half of the stroke in either direction or the first half in one direction. The inner member in indexing does not actually turn back with reference to the other part; it merely lags behind while continuing to turn in the same direction.

The rear view of the machine Fig. 7 shows the pneumatic cylinder to operate the chucking mechanism. Air is admitted to and exhausted from it by a hand-manipulated valve conveniently placed to the operating position. The cylinder is calculated to deliver a drawbar pull of 6,200 lb. with 80 lb. of air in the mains. The drawbar connects directly to the stub arbors and collets by which the work is held to the spindle of the machine.

If the gear to be shaved is bored, a stub arbor with a groove near its outer end for a slip washer is employed to hold it. Various collets, with different sized bores to fit different arbors, are interchangeable in the No. 14 taper hole in the front end of the spindle. The gear to be shaved is slipped over the stub arbor, the slip washer set into the groove and air pressure applied to draw the gear against the serrated flange of the collet.

To hold cluster gears a separate arbor, attachable to the end of the drawbar inside the spindle bore by a bayonet lock, is employed. This arbor may be seen in place in Fig. 2. The outboard bracket *D* is used only in connection with this arbor to support the outer end. At other times the bracket is removed from the machine. Stem gears are held in spring collets attached directly to the drawbar.

In setting a gear into the machine it is necessary to locate it exactly with respect to the shaving tools, else the work will not be divided equally between them. For this purpose the machine is turned forward by means of the handwheel until the two pointers *T*, shown in Fig. 8 coincide, the vertilcally-moving plunger, *S* actuated by the crank handle to be seen in Fig. 2, rises into engagement with the teeth of the gear and air is admitted to the cylinder.

The shape of the plunger, here shown in the form of a modified rack tooth to enter a space in the gear, depends upon the number of teeth lying between those upon which the tools operate (not upon the number of teeth in the gear). If that number is odd, instead of even as here shown, the end of the plunger will be formed as a tooth space to engage a tooth of the gear midway between those being shaved. Therefore the upper end of the locating plug is easily removable and is interchangeable with others. Figs. 8, 9 and 10 show the relative positions of the parts when loading, with the right-, and with the left-hand tools, respectively, engaged.

Contrary to what might be supposed, the setting of the shaving tools after regrinding is a matter of extreme simplicity. In Fig. 11 may be seen one of the tools—they are exactly alike—with the holding and adjusting screws that remain with it to locate and secure it in the grinding fixture as well as in the machine. In the face of the tool carrier is a vertically-disposed rectangular-shaped groove, open in front and with a U-shaped slot near the upper end of the otherwise closed rear to admit the collar-head bolt by which the tool is held. The slot is faced on one side and on the rear with hardened and ground steel plates. On the other side a setscrew, which remains permanently with the carrier, is tapped in to bear against the corresponding side of the tool. A hardened steel plate also closes the lower end of the rectangular groove.

To remove a tool from the machine for regrinding it is necessary only to turn back the setscrew sufficiently to relieve the pressure, turn back the collar-head screw an equal amount and lift the tool out of the groove. Its fastening in the grinding fixture and its return to the machine are equally simple, as it is always located horizontally by the side and back of the groove and vertically by the adjusting screw bearing upon the steel bottom plate.

After a dull tool has been removed from the machine and sharpened by grinding at *U*, it is restored to correct length by adjusting the screw *V* and nut *W* while the tool is held in a fixture equipped with a gage set dial indicator. There is, therefore, no adjustment of any kind necessary after tools are placed in the machine.

Theoretically the cutting edge of the tool should be a straight line, and if all gear shafts could be depended upon for absolute parallelism it would be so made. As perfection is not yet attained, even in automobile construction, the face of the tool is hollow-ground to a depth of 0.0004 in. by the simple expedient of tilting the head of the vertical spindle grinder upon which the work of manufacture is done. This leaves the teeth 0.0008 in. thicker midway of the gear face, calculated to forestall point contact of the teeth at one side or the other of the gear.

Form Grinding

Next week the first of six articles describing a new method of grinding circular formed cutters with formed grinding wheels will be published. The method was developed by Brown & Sharpe and can be employed in any toolroom equipped with the necessary attachments for its grinding machines.

Meeting the Problems of the Contract Shop

By George S. Brady
Associate Editor, American Machinist

PLANT location is a somewhat different problem to the contract shop than it is to the average production factory. While the plant making a regular product can readily have a national distribution, the contract shop has ordinarily a very limited sphere of influence, and depends largely upon contracts made within easy reach, so that there is personal contact. In many cases, the contract shop has had its beginning in a local demand from mills and production plants for a shop that could handle repairs and build special machinery or tools. However, there are to be found contract shops that have built up a reputation for designing and making high-grade tools and dies, and can obtain work on contract from factories at a considerable distance. This principle also applies to special machinery building, but it is found in practice that when the special machine has opened up a market for itself, its main mechanical features are so standardized that it can be readily put on a production basis and no longer figures as a contract job. Another exception to the local sphere of influence is the contract shop doing heavy work and located in an iron and steel center, where it has a decided advantage in the cheaper raw materials that are a large factor in the heavy work. As a general rule, the average contract shop finds its most profitable work in a small area, this area varying from the range of its own city to several hundred miles, depending upon the density of manufacturing plants and the number of other contract shops competing. In the metropolitan district of New York, where rentals are high, labor costly, and access to raw materials not good, there are numerous accessible contract shops that live almost entirely on local contracts. They build special machinery, tools, and dies, and do repair work for the many varied industries that have concentrated in the city. A large number of them also do a certain amount of contract production work in the making of articles for inventors, or for companies that have sales offices in the city for marketing their products, but do not care to handle the mechanical work of manufacture themselves. In these city contract shops, castings and forgings are usually bought outside on sub-contracts, and when very heavy castings are required, they are best purchased from a foundry that can supply them with the heavy machine work completed. These shops in a large city are also always limited on storage space, but

The second of three articles. The third will appear in an early issue.

The city contract shop that is located in a rented loft, Fig. 1, must necessarily be limited in its handling equipment and in the size of work that it can do effectively. It is also usually crowded for storage space. But it has advantages in proximity to firms calling for articles to be made on contract, and it has at hand large jobbing houses that can supply it with materials on short notice. The country shop, Fig. 2, on the other hand, has other distinct advantages in better labor conditions and more adequate space. It can readily expand if the need should ever arise

this is offset by the fact that they have at hand the large supply houses that can furnish them with steels, brass, bronzes, bearings, bolts, and other materials on short notice. Among these city shops are also some that have established reputations as experts in the building of specific types of special machinery, and when this happens, the orders may come from distant points. This also applies to the general repairs to such machines. In the layout of machines in a contract shop, it is apparent that no definite plans can be followed. The nature of the equipment also varies widely. In practically all cases of established contract shops, the equipment has grown as the new contracts have called for a new machine, and the type of work that can thus be handled best by any particular contract shop largely depends on the type of machines bought for the first jobs. This also applies to the production plant that takes contract work to "fill in." These latter shops can safely take only such jobs as can be conveniently assigned to the idle equipment. In general, therefore, the most satisfactory arrangement is for the contract shop to continue to do certain limited classes of work. At the same time, it is up to the company giving out the work to select the contract shop that has the equipment best suited to its type of work. These general rules account for the fact that in every mill center will be found contract shops specializing in the type of machinery and repair work needed for the mills in its locality, and the isolated mill must usually send a long distance to have its contract work done. Contract shops in steel centers or sugar districts may thus have heavy lathes or hydraulic presses that will not be found in general contract shops in other places.

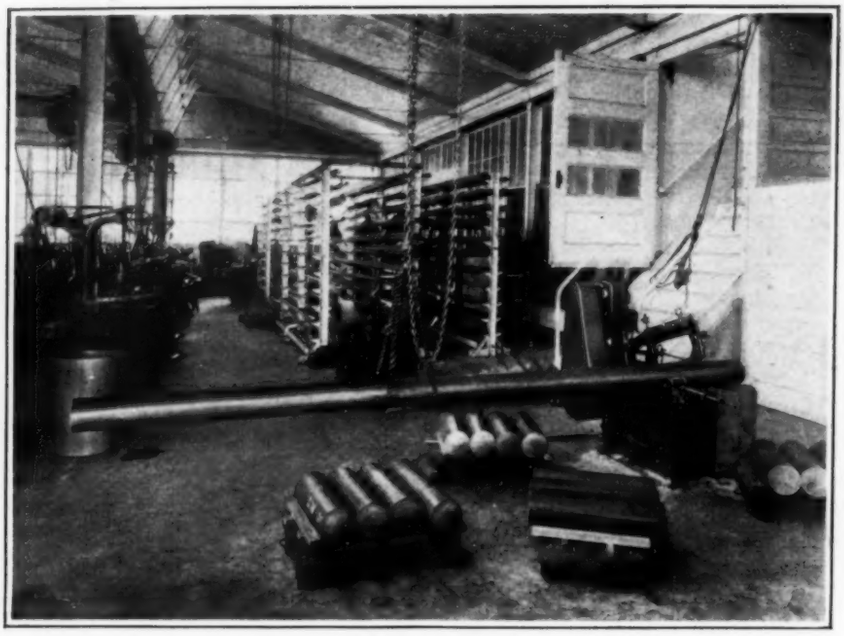


Fig. 3—This contract shop has flexibility of machine equipment. The saw was moved to the entry under the overhead runway to cut up heavy bars arriving for a special job. The shop is also provided with various types of trucks for handling materials, one small type of which is shown

The progressive contract shop, however, does not always wait to purchase its machine equipment until after the contract has been obtained. One shop, for example, determined to get the gear work in its locality, as the neighboring factories had to send some distance to the nearest gear manufacturers for replacements. It put in a full line of new gear-cutting machinery, and then went after the contracts, basing its claims on speed and the best modern equipment. Another shop put in an expensive jig boring machine, in order to take in more tool work. From the standpoint of the company giving out a contract, it is most important to know in advance the type of equipment available in the contract shop, since it often results in embarrassment and delays if sub-contracts must be let out to do various parts of the work; or it may result in unsatisfactory work where so-called clever set-ups have to be made because suitable machines for the job are not available.

The facility with which a contract shop can adapt itself to a change order, or to a new contract, is perhaps next in importance to the type of equipment. The shop that loads itself with a large number of small and varied orders can easily become "tied in a knot," and render poor service. The variety of jobs may prevent it from ever approaching a systematic basis of work or arrangement of machines. On the other hand, the shop that obtains a few well-chosen jobs, and then uses smaller contract and repair jobs as fillers, can handle its program more systematically. One contract shop of this kind has electric plugs and piping connections at intervals all over the machine shop floor, and as soon as a contract for a quantity of similar parts is obtained, the necessary machines are shifted and connected up as near to a sequence of operations as possible. All machines are motor driven, and, with this arrangement, they can be shifted so conveniently that a cold saw or drill can be moved to the work in some cases more easily than the material can be moved to the machines. Another shop obtains the same facility of machine rearrangement by having a complete overhead system of electric leads, air, and other connections. This shop has in its planning office a scale plan of the machine rooms, with movable outlines of the machines, so that the moves can be planned and scheduled.

On the other hand, in the building of special machinery, where the number of similar pieces to be made is small and the quality of the work is high, it is the practice to arrange the machine work in departments, such as lathe, planer, etc. Work of this kind is always done to carefully made drawings, usually with tolerances allowed, so that there will be little or no fitting on the assembly floor. The cost of transporting the work in this case is of minor importance, and the advantage of machine specialization is obtained. In plants building special machinery, it is almost always essential to have a testing floor where the machines can be run under operating conditions. This is usually in connection with the assembling department, and the tests are made by assemblers rather than by inspectors. Few special machines give entire satisfaction on first trial, and it is found necessary to have one or more assemblers who are capable mechanics take an interest in the machine from the standpoint of what it is intended to accomplish. At the same time, the chief engineer or designer invariably follows the work on the assembly floor and through the tests. And, in the case of entirely new machines, the

inventor or representative of the buyer is also called in, and much time is spent on the assembly floor in "development" work. Since any kind of a motor to suit the customer's power supply is likely to be used on a machine, the testing department must have both direct and alternating current leads, as well as several different current phases.

The contract shop that expects to handle a variety of work, especially small articles in fairly large lots, must be equipped to take care of various kinds of finishes as desired by the customer. This usually includes tumbling, pickling, painting, enameling, and nickel plating. Some shops are also equipped to do metal spraying, parkerizing, or cadmium plating. However, any one contract shop is rarely, if ever, equipped to do all of them. It must select its contract jobs primarily according to its available machine equipment, and at the same time come to an understanding with the customer in regard to the finish necessary. Usually, there is some other shop in the locality that has equipment for the special finish required, and where, with the customer's consent, the work can be sent on sub-contract. Usually, a contract shop is prepared to do any heat-treating of the parts necessary, but in the larger centers there are also contract shops that specialize entirely on heat-treating work. There are other shops that likewise specialize entirely on plating, or other finishing work. The heat-treatment and finishing of the work, therefore, is usually not a deciding factor in the acceptance of contracts with the average contract shop.

Handling equipment is too often treated by contract shops as of minor importance, and because of this, contract shops are often located in rented lofts or in buildings that cannot be equipped with cranes at any reasonable expense. But, on the contrary, the modern, progressive contract shop has given the handling problem its full share of attention, and adequate crane equipment is provided to take care of the heaviest work likely to be taken in. Arrangements are also made to handle raw materials in as progressive a manner as possible, and to take care of the handling of outgoing shipments in the same way. In general, the handling equipment of the contract shop is just as important as it is in the production shop. The whole question of equipment is a vital problem in present-day contract work, and is probably one of the most important factors in holding down the overhead to a percentage low enough so that the right kind of contracts can be obtained.

The Need for Aircraft Engines

AIRCRAFT engines are now receiving much attention in various quarters and it is high time as they are the crux of the airplane industry at present. Without engines that are reliable and efficient, the best designed plane is of little value. The dependence of the plane on its engine makes it a vital problem for the industry.

Pioneers, as usual, blazed the way and fortunately some of them are now receiving their rewards, which is not always the case. Following their lead others are now entering the field and some of the newer engines are making good names for themselves. Others are developing engines that give promise of satisfactory operation and it is probable that the present year will show several valuable additions to this very necessary field. It is, however, not a problem to be attacked without careful study and a full realization of what good workmanship and reliability really mean. Only the best is good enough for aircraft engines.

SEEN · AND · HEARD

By John R. Godfrey

Materials—Riveting and Welding

THE development of new materials and the improvement in those of older vintage, is hardly appreciated. Who would have dreamed of the many uses to which aluminum, in its many alloys, is now being put. Originally its lightness was its only recommendation. For in spite of original claims, it *did* tarnish and its strength was a close second to that of a piece of custard pie. By adding a little copper, however, and otherwise improving the mixture, modern metallurgy has made the aluminum alloys standard materials for many parts that stand unusual stresses in reciprocation and revolution, such as connecting rods and other parts.

When it comes to steel, our metallurgists have also done themselves proud. The newer alloys, which we are fortunately dubbing with short nicknames such as "moly" for molybdenum, are marvels in many ways. The steels of Demascus, famed in story and tradition, would not be tolerated today according to recent assays of the old material. Their fame seems to have come by contrast with the poorer metal used elsewhere. For, as the story goes, it was a common occurrence for "ye doughty knight" to take "time out" to straighten his sword blade of iron after a lunge against a good coat of mail.

* * * *

Things do not "stay put" very long in the realm of mechanical operations. Forty years ago the machining of flat surfaces was a job for the planer and only a few hardy souls with radical ideas, such as John J. Grant and a few others, wrote of the change that was to come. Milling was considered very convenient for fluting taps, reamers and the like, but it was hardly dreamed of as a rival for the planer. Yet, today, none of the flat surfaces that go into automobile construction are produced by planers. The surfacing of cylinder blocks, crank and transmission cases and the like, is all done on milling machines.

In a similar way the welding method is replacing riveting in buildings and other structures. The noisy riveter seems destined to give way to the brilliant, sputtery, but silent welding method.

Some airplane builders and builders to be, are however, seriously considering a return to riveting instead of welding the tubular fuselage. One reason is the lack of a method of detecting imperfect welds, and the other is the desire to use duralumin in place of steel as a material. For while "dural" can be joined by welding, the heating of the metal greatly reduces its strength, and the joint, therefore, becomes much weaker than the rest of the metal. It is, of course, quite possible that a method may be devised for restoring the strength, as by heat-treating. But in the meantime we have airplane structures built up of duralumin, in various shapes, and held by riveting at the various joints.

In one lot of large planes now under way, there are 75,000 rivets in each, and these do not have metal wing covering. But special riveting devices handle the work much more rapidly than one might expect.

Car Repairs

How They Are Handled in a Small Shop

By Frank W. Curtis
Western Editor, American Machinist

FREIGHT-CAR repairs at the Denison, Tex., car shops of the Missouri-Kansas-Texas Lines are handled on a production basis, using a progressive system in which the cars and not the men are moved. All work to be done is programmed. Cars that are to undergo general repairs are grouped in accordance with their classification and stored in yards adjacent to the shops. From 300 to 500 cars are generally put through at a time. In order that the proper material in sufficient quantities will be on hand at the time the work is undertaken, an inspection is made of about 25 per cent of the total cars programmed and material is ordered on the percentage basis. No cars are brought into the shop until sufficient material is available to go ahead with the work.

The main buildings include the steel shop, the wood-erecting shop and the siding and roofing shed, arranged in U-form with the transfer table separating the wood-erecting shop from the other two. Another building, centrally located, houses the toolroom, the blacksmith shop and the machine shop, while the painting and inspection departments are adjacent to outgoing tracks.

In general, cars are handled in twelve stations, in each of which a stipulated portion of the work is handled. Each position is timed and is manned by an adequate force in order that uniform progression can be maintained. With 135 men as the normal force actually working on the cars, a car is completely repaired every hour and a quarter, average, or at the rate of six cars per day. This force, however, is increased if more production is required, since the shop can easily repair fourteen box cars daily, if necessary. A whistle in the steel shop controls the movement at all stations. When a car reaches the last station in this building, preparatory to being transferred to the wood-erecting shop, the signal is given, which means that every car is moved one position. In brief, the car is taken to a stripping track where all defective material and rust are removed. Following this operation the car is moved to the steel shop where all defective steel parts are renewed or repaired, the trucks are rebuilt, draft gears repaired and the underframe given two coats of paint. Operations in the wood-erecting shop include the application of sub-sills, flooring, superstructure framing and lining. The cars are then moved to the siding and roofing shed where the siding, roofs, doors, safety appliances and miscellaneous trimmings are applied, rendering the cars ready for the paint shop and then for inspection.

New cars are started in the steel shop on a track designated for the purpose, where the car is built up from the trucks, including the reaming and riveting of the sills, diaphragms and bolsters, thus completing the bottom section. After the sides and ends have been riveted together on jigs they are applied to the superstructure, the cars are given a coat of red-lead paint preparatory to being transferred to the wood-erecting shop where the same procedure is followed as in the case of repair jobs. One of the gang punches used in punching steel plates and channels is illustrated in Fig. 1. Two similar machines are available for such work, each being equipped with an electric jib-crane to facilitate the handling of heavy work. In addition, single punches are available for operations not suited to a gang set-up.

Among other equipment in the steel shed are several electrically-operated rivet heaters, such as shown in Fig. 2. Each unit has two heating contacts which enable a constant supply of rivets to be heated for a rivet gang. The lower jaws hold the rivets by spring pressure, controlled by a treadle. Two sizes of rivets can be heated at one time if desired. Most of the rivets are headed in place by air-operated rivet squeezers as illustrated in Fig. 3, the squeezers being suspended from jib cranes located in convenient positions throughout the shop.

A device that does the work of three men is the air-operated nail driver, illustrated in Fig. 4. Three of these

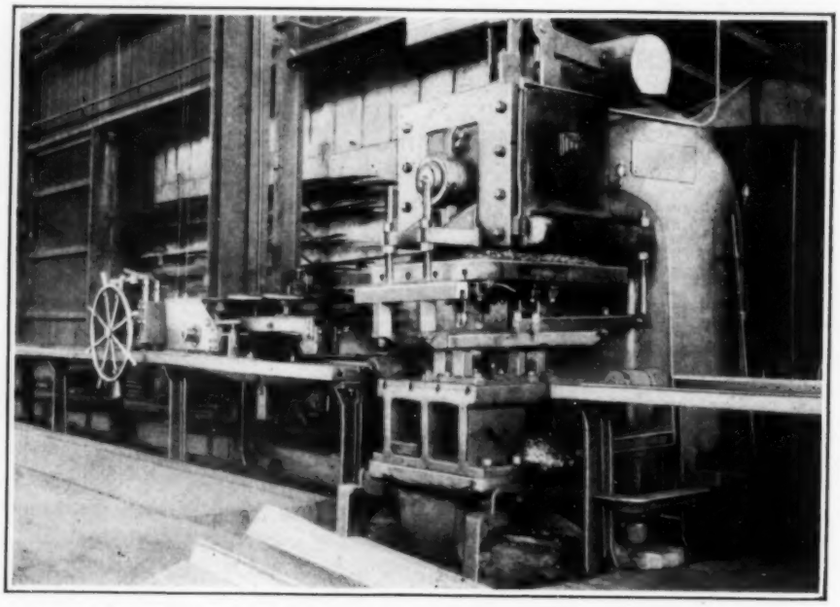


Fig. 1—One of the gang punches for plates and channels for repair jobs and for the construction of new cars. Machines of this class are equipped with an overhead crane to facilitate the handling of heavy work. Work not suited to a gang punch is routed to miscellaneous single punches

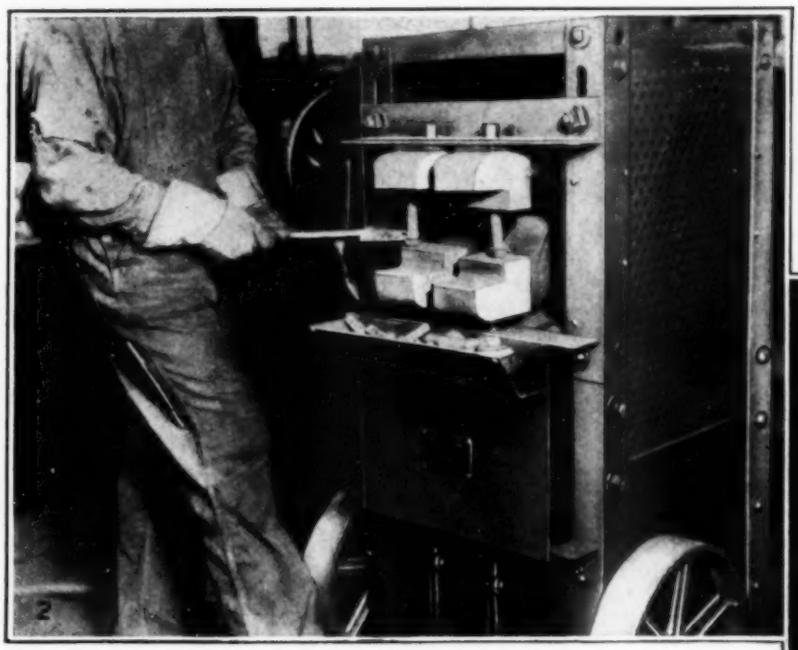


Fig. 2—Rivets are heated by electrical heaters having two sets of contact jaws so that a constant supply of rivets can be fed to a riveting gang. The heaters are portable and can be arranged to accommodate two sizes of rivets if necessary. The pan located under the jaws holds a small supply of rivets

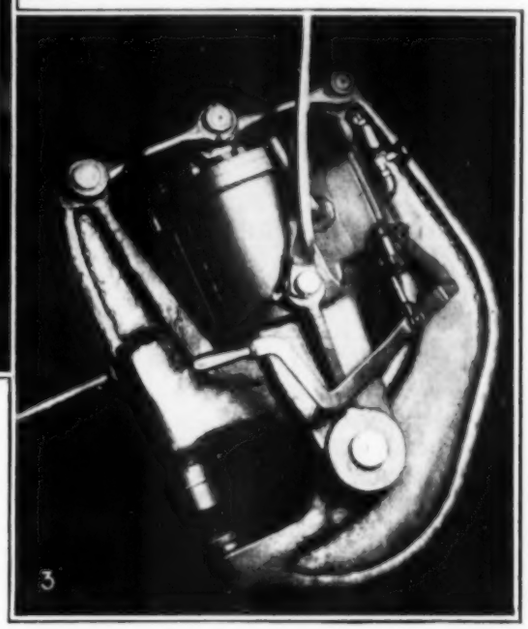


Fig. 3 — Most of the riveting is done by air-operated rivet squeezers that are suspended from jib or traveling cranes enabling them to be transported to convenient locations. Units of this type, in connection with the heaters, enable the riveting of a car to be handled in a comparatively short time

Fig. 4—Air-operated nailing machines have shortened the time of decking freight cars. With one of these units one man can handle work that normally required three men. Nails are fed to the nose of the machine through a tube and are driven by an air-hammer

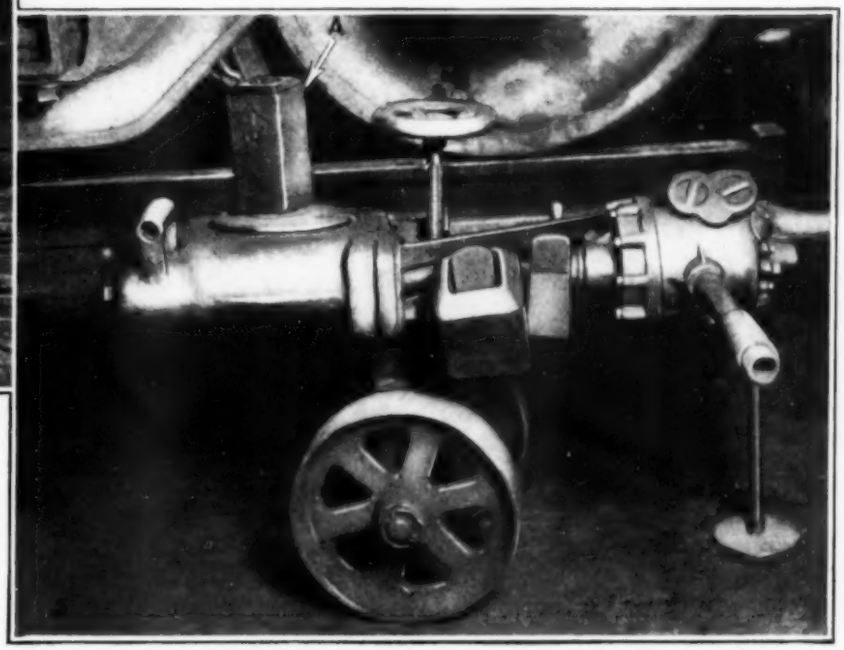


Fig. 5—Among other labor-saving devices is the nut driver used in tightening the nuts on bolts underneath the trucks. The unit is portable, being driven by an air-operated motor through worm gearing. The socket is raised and lowered by a hand-wheel

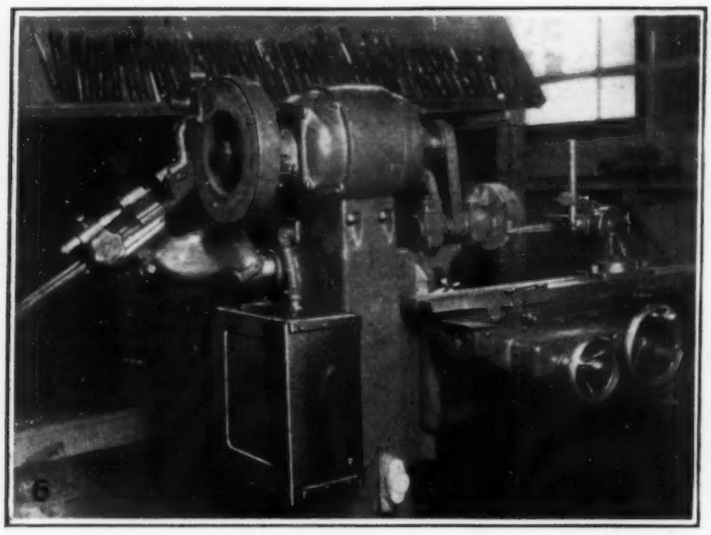


Fig. 6—In order to keep tapered reamers and drills in condition, a combination grinding machine has been installed in the toolroom. A large supply of small tools is kept on hand at all times in order that production will not be retarded. Fig. 7—Considerable time is saved in trimming bolt ends with an air-operated bolt cutter. Two cutting jaws are attached to levers, one of which is connected to the body of the air cylinder and the other to the piston rod. A similar device is employed for splitting nuts when stripping cars for overhauling

units are available, although one of them can handle the entire decking of a car in a comparatively short time. Nails are fed, one at a time, in the tube at the right and pass to the end of the nose piece of the hammer in a vertical position. The hammer is spring mounted on slides and is held down by a treadle, so that with a nail in place it is necessary only to pull the trigger and press the foot downward. A 40-penny nail can be driven in five seconds with the device.

Another labor-saving device is illustrated in Fig. 5, which shows a nut tightener used for tightening the nuts of column and journal-box bolts on arch-bar trucks. The unit is mounted on wheels and is driven by an air-operated motor. The socket *A* is driven through worm gearing and can be adjusted to the proper height by a hand-wheel that raises or lowers the entire frame. Interchangeable sockets are provided in order that nuts of different sizes can be accommodated.

Realization of the fact that only properly-ground reamers or drills will turn out good work, is largely responsible for the combination grinding machine, illustrated in Fig. 6, which is used for reconditioning such tools. Tapered car-builders' reamers are resharpened in the attachment at the right, while at the left is an attachment for grinding drills. The machine is located in the toolroom where an ample supply of properly sharpened tools is kept.

Much time is saved in trimming bolt ends by the air-operated bolt cutter shown in Fig. 7. The cutting jaws, made of tool steel, are attached to levers, one of which is fixed to the air-cylinder body and the other to the plunger rod. A leverage ratio of 6 to 1 gives sufficient power to clip off bolts up to and including $\frac{3}{4}$ in. One man goes all over the car, trimming all the long bolts before the car goes to the paint track. A similar device is used in splitting nuts on cars to be stripped for overhauling, the main difference being that the jaws are arranged at right angles to those in the bolt cutter shown.

Apprenticeship in Dull Times—*Discussion*

By A. W. Forbes

ON PAGE 559, Vol. 68, of the *American Machinist*, C. J. Freund answers a few of the objections to starting apprenticeship in dull times, but unfortunately does not answer the serious difficulties. Nothing is to be gained by starting apprenticeship in either good or dull times if it is to be given up for the same reasons that have caused past abandonment.. There were many causes, but the chief one was the lack of capable boys. The employer selected the best boys who applied, and when the grade of applicants fell to the point where but few made good, apprenticeship was abandoned.

Mr. Freund mentions the need of the favor and confidence of the community, but he does not say how to get it. Too often the general public only looks at the fact that apprentices are paid less than skilled workers, and it is thus considered an effort to reduce wages all along the line. It is also quite natural for the old employee to think that the employer wants to have the apprentice take his job at a lower wage than standard.

The loss of confidence on the part of the public is possibly due to a large extent to the fact that so few apprentices make good, which is due to the low grade of applicants, which in turn is due to the lack of confidence. This is a vicious circle that is hard to break.

There are certain ways that apprenticeship can be helped. In the first place, joint publicity for apprenticeship might let the public know that there were opportunities along this line. Another course of action to help apprenticeship is to limit apprentices to those who have a reasonable prospect of success. Every college finds it necessary to maintain standards for entrance, as well as for residence. A college that took any applicant would soon find that it was not a college, and it is the same with apprenticeship. The need today is to raise the standard of requirements so as to result in a reasonable amount of success.

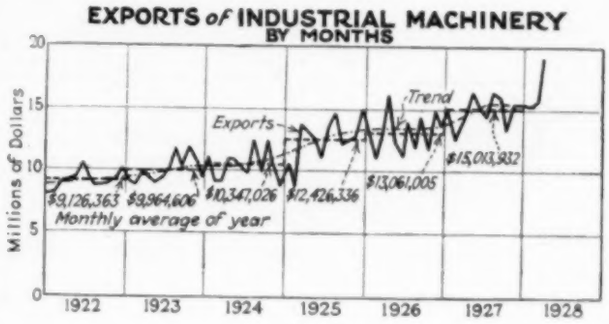
Activity in the Metal-Working Industry

Increase Indicated During April

That an increased rate of operations was witnessed in the metal working plants of the nation during April is indicated by preliminary data received upon the consumption of electrical energy by a large number of these plants. The downward trend in operations which was indicated during March appears to have been succeeded by an upward trend during April. The April rate of activity in these plants was about 5.2 per cent over that reported for March, but was about 7.5 per cent under the peak of operations reported for February. April operations, however, were still about 11.3 per cent over April of last year, and the average rate of operations during the first four months of the current year was about 12.3 per cent over the average operations for the same period last year.

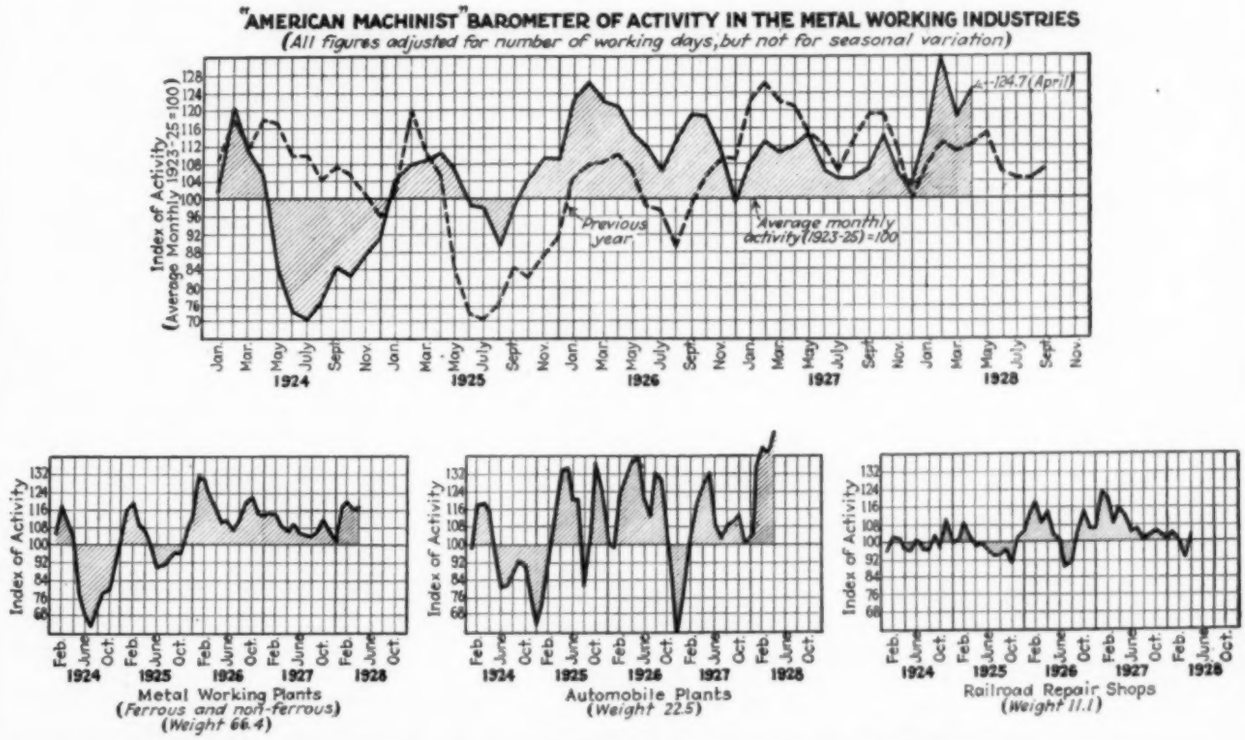
The ferrous and non-ferrous metal working plants reported April activity about 0.4 per cent over March, but 7.5 per cent under the peak of February. The April rate of operations of these plants was, however, still about 11 per cent over that recorded during April, 1927, and 1.7 per cent above April of 1926. All branches of the automobile industry appear to be operating at record rates. Not only was the April rate of automobile production reported to have been above that of any previous month, but the manufacture of replacement parts for the cars already in use was probably between 25 and 30 per cent over that of a year ago.

An upward trend was reported during April in the activities of the railroad repair shops, although the figure is still about 10 per cent under that reported for April last year.



Exports of industrial machinery for the month of March showed considerable increase over those of February, according to figures furnished by the U. S. Department of Commerce. The largest increase was in oil-well, mining and pumping equipment, March exports in these lines going to $3,445,562, over $1,100,000 in excess of the February figure, which had declined sharply from January.

Exports of construction equipment and conveyors gained in value 42 per cent, and similarly exports of textile machinery rose 33 per cent. There was practically no change in the value of power-driven metal-working equipment, but in other metal-working tools, a gain of 19 per cent over the February figure was noted.



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IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Follow-Up Card for Toolroom Work

By Charles S. Hazard

Many drafting rooms have become educated to the advisability of keeping each tool designer and detailer supplied with an accurate list of the sizes of steel carried in the stockroom for making tools, fixtures and gages. We go a step further, and have the draftsman list the

DATE ORDER ISSUED _____ NO. OF CARDS _____
DATE TOOL COMPLETED _____ CARD NO. _____ TOOL NO. _____
LOT NO. _____
NAME _____
USED FOR _____
DRAFT. ROOM TIME _____ PATT. SHOP TIME _____ TOOL ROOM TIME _____ EST. TIME _____

DETAIL NUMBER	AMT. REQ'D	SIZE OF STOCK	MATERIAL	PATT. STOCK NUMBER	PATTERN ORDERED	PATTERN REC'D	CASTING ORDERED	CASTING REC'D	LATHE	MILL MACH.	SHAPER	PLANER	HAND	DRILL	BENCH WORK

Follow-up card for toolroom work

sizes of the piece of stock to be cut off for each part of every toolroom job, on the follow-up card shown herewith. Patterns to be made and parts or materials to be purchased, are also listed on this card, which goes to the toolroom with the tool drawing.

We have found that the man who makes the drawings is best able to figure out the necessary stock, quickly and accurately. What is still more important, this system makes the draftsman more careful to use standard sizes of stock in his designs.

Hammer for Straightening Metal Stampings

By Louis L. Locke

In making sheet-metal stampings that are long and narrow, it is not uncommon for them to be slightly bowed or bent in the center, as the result of strains set up during the blanking process. A restriking operation is frequently used to straighten them, but this method does not always produce satisfactory results, because the stampings often spring back a certain amount. By using the hammer illustrated in Fig. 1 the difficulty has been practically eliminated and the straightening has been made an easy task. The work is placed on a steel block having a slightly concaved face, so that when the ram of the hammer strikes it the reverse bend is made. Several blows are given each piece, depending, of course, upon its condition. The blows are distributed along the entire length of the part especially at the point where the bend is more pronounced. The blow can be varied from

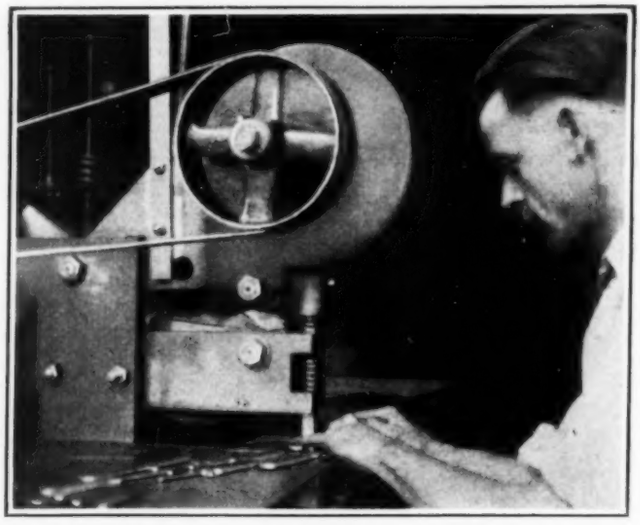


Fig. 1—A hammer for straightening sheet-metal stampings

light to heavy, the variations being controlled by a treadle in connection with a cam.

Constructional details of the hammer are given in Fig. 2. The arm *A*, driven at 250 r.p.m., carries the two rollers *B* that strike the pin *C*, giving it two blows per revolution. The rotating mechanism is contained in a frame pivoted to the main frame of the hammer at *D* and is supported at its outer end by the cam *E* on which

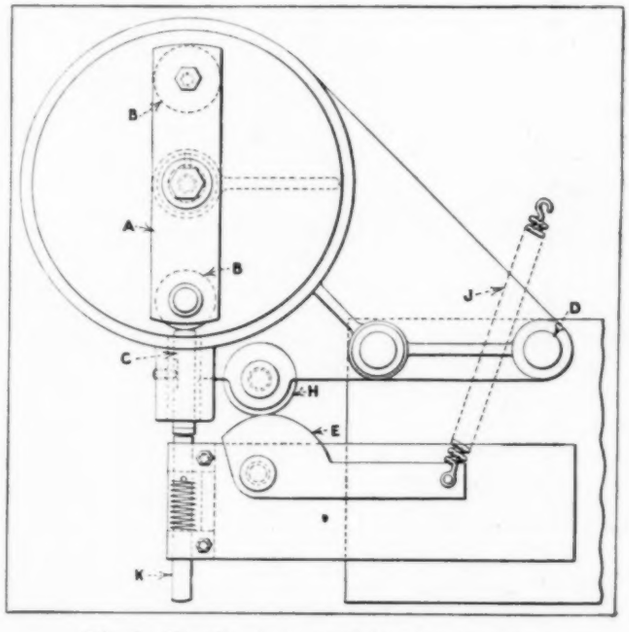


Fig. 2—Details of the straightening hammer

the roller *H* bears. The cam is operated by a treadle, downward movement of which is opposed by the spring *J*.

The ram, or hammer proper *K*, is mounted in a bracket attached to the main frame, and is directly under the pin *C*, which pin is kept in contact with the ram by gravity. When the rotating part of the hammer is raised to its highest by the cam, the rollers clear the pin *C*. As the cam is rotated, lowering the mechanism until the rollers just contact with the pin *C*, very light blows are given. Further lowering of the mechanism results in increasing the intensity of the blows. The hammer is in use in the plant of the National Cash Register Company.

Staples for Holding Paper on Drawing Boards—*Discussion*

By E. R. Plaisted

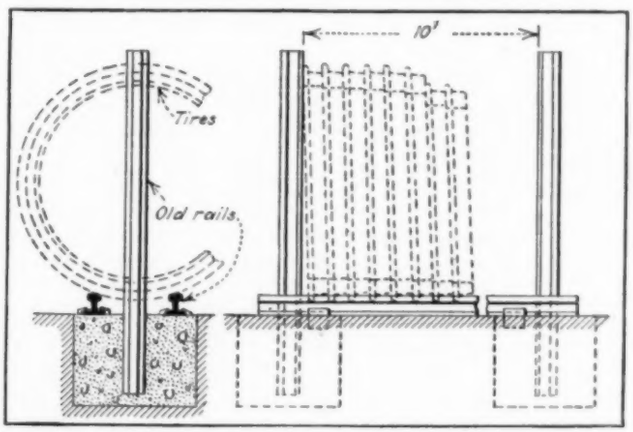
On page 591, Vol. 68, of the *American Machinist*, is an article under the title given above, by I. B. Rich. The idea looked so good to me that I requisitioned a stapler, intending to remove its base and use it as Mr. Rich suggested. I was told that a stapler was made purposely for draftsmen, without base, so I ordered one and it has proved to be a dandy. It is not necessary to make the "improvised crowbar" Mr. Rich suggested, as a special staple remover came with the device.

This little thing will pay for itself in a year in the saving of tacks, to say nothing of preventing the ruination of the surface of drawing boards, as the tiny holes left by the staples will not let a pencil point go through and puncture the paper. Also, it has the other advantages mentioned by Mr. Rich in his article.

A Storage Rack for Locomotive Tires

By Frank Waldo

Locomotive tires, usually stored outdoors, are often stacked horizontally chiefly because no other means is provided. When so stored, handling is somewhat difficult unless an overhead crane is available. Storing tires vertically on the rack illustrated has simplified handling these units. Loading and unloading is done by a crane-equipped tractor which can be located on either side of the rack. Racks can be laid out parallel with one another, allowing sufficient space between them for operation of the tractor, or they can be arranged in one line.



A rack that stores tires vertically

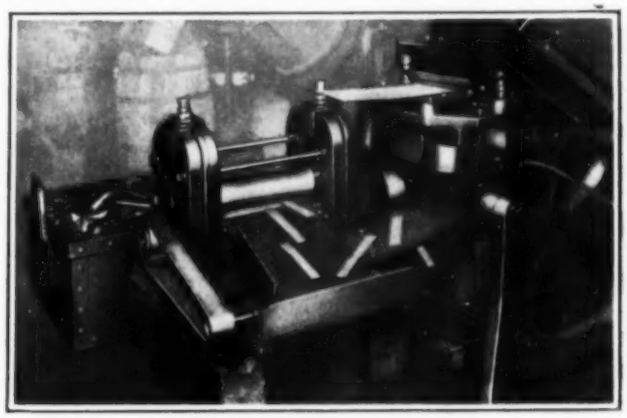
Obsolete rails are used in constructing the rack. Two sections are mounted vertically and set in concrete foundations, so that the spacing between them is approximately 10 ft.. Two rail sections are laid horizontally on the foundations to form a base on which the tires rest. These rails are spaced about 2 ft. apart and keep the tires from rolling. This method of storing permits rain water to drain from the tires.

Straightening Attachment for Blanking Press

By Oliver Franklin

In the illustration is shown an inclinable press blanking out strips of core iron, about $1\frac{3}{8}$ in. wide, from strip stock $8\frac{5}{8}$ in. wide. The blanked strips are used in building up compensator magnet cores and it is necessary that the pieces be straight and free from burrs. In order to attain this result automatically a small set of straightener rolls was applied to the press, which is located at the Bloomfield works of the General Electric Company.

The roll stand is mounted on separate wooden skids and is driven by an independent motor through a silent chain. The two press rolls are about 5 in. in diameter, and the upper roll is screw adjusted to allow the passage of a single thickness of strip. Feed of the strips to the rolls is accomplished by an endless single-ply leather belt, about 14 in. wide, driven from a take-off pulley on the lower roll as shown. A sheet-metal chute conveys the strips to the belt as they fall through the press after the blanking operation.



Straightener and burr-removing attachment for blanking press

It does not matter in which direction the piece goes through the rolls, but if two pieces go through together, both are damaged. Such spoilt pieces are easily culled out during the inspection that follows.

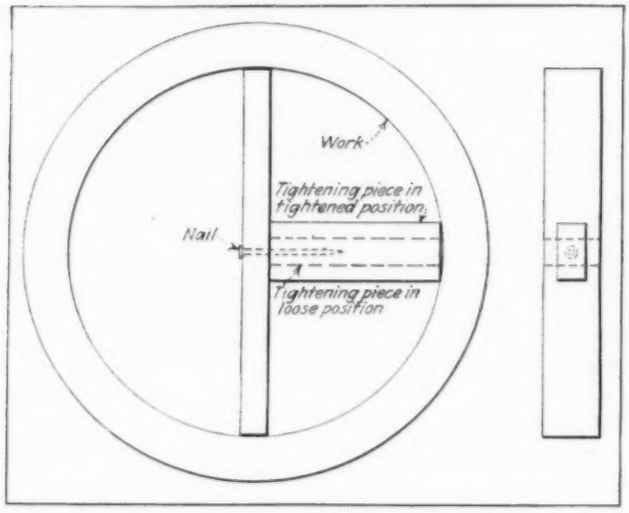
An Improved Centering Plug

By H. Moore

In drawing circles that are concentric with bored holes, it is usual to cut a piece of wood and hammer or wedge it crosswise in the hole, so that one leg of the dividers can be centered upon it. If the piece is too long it is generally hammered into place, crushing the grain at

one end. If it is too short, wedging of some kind is resorted to. In either case the piece is apt to come loose at the critical moment.

When I have a job of this kind to do, I cut a piece of $\frac{1}{2}$x$\frac{3}{4}$-in. wood to fit the hole easily when inserted edgewise. I then cut another piece of the same width and thickness and of a length a trifle shorter than the diameter



Centering plug that does not require to be driven

of the hole. One end of the shorter piece is attached to the center of the longer one by a nail, as shown in the sketch. The opposite end of the short piece is trimmed so that both pieces can be pushed into the hole when their wide faces are parallel with the axis thereof.

Obviously with the pieces so placed, a quarter-turn of the short piece will tighten the plug in the hole. Another quarter turn in either direction will loosen it so that it can be removed easily.

Staples for Holding Paper on Drawing Boards—*Discussion*

By Wm. C. Wise

There are several practical objections to the use of staples in lieu of thumb-tacks in the drafting room, as suggested by I. B. Rich in an article under the title given above on page 591, Vol. 68, of the *American Machinist*. When stapling machines are used, there is a tendency for the staples to jam in the machine, with the consequent loss of time, while the draftsman turns mechanic to recondition it—usually without any adequate tools for the purpose.

Unless each draftsman is supplied with a stapling machine of his own, there is considerable time lost while he traces the present possessor of the machine.

Several simple improvements over the ordinary use of thumb-tacks suggest themselves. One is to use thumb-tacks through a long strip of heavy detail paper over the edge of the drawing, so that the lifting of one end and peeling of this strip facilitates removal of the tacks. Another is to use short adhesive-paper strips to paste the drawing down directly on the edges (outside the margin) to the detail paper previously laid as a foundation on the drawing board. The part of the drawing paper to which the adhesive strips still adhere, can be trimmed off when the drawing is finished.

Practical Shop Problems

Questions of a Practical Nature will be answered in this column

High-Speed Steel for Hand Reamers

Q. We would appreciate your comments on the relative merits of high-speed steel and carbon steel for use in hand reamers. Is it true also, that most hand-reamers are now power driven?

A. In general carbon-steel reamers will give a better finish than the high-speed steel reamers, and offer a keener cutting edge. But the high-speed tools have the best cutting qualities at high speeds and high temperatures. There is no advantage, therefore, in using high-speed steel in hand reamers if it is certain that the tool will only be used for hand reaming. But the average hand reamer in the shop is likely to be picked up at any time and run in a power-driven machine. Therefore, it can be readily seen that an average shop may desire to sacrifice the extra finish that it would get on the relatively few hand-reamed holes, in order to provide a reamer that will stand up under heavy duty. We are informed by one of the large makers of reamers that the chief call is for high-speed steel hand reamers.

Straightening Large Steel Washers

Q. We have made up about 1,100 hard-temper steel washers, all $\frac{1}{16}$ in. thick, some of which are 5 in. outside diameter, and some 4$\frac{1}{2}$ in. outside diameter, with a 1$\frac{3}{8}$ in. hole in the center. While these steel washers are flat enough for ordinary use, our customer has rejected them on the grounds that they are not perfectly flat. He states, however, that he will take them off our hands if we can flatten them.

We have tried to do this, using a number of methods, but without success. We find the steel itself was not perfectly flat and have been informed by some of the steel makers that it is impossible to obtain cold-rolled steel in sheets from stock that is perfectly flat. Can you furnish us with any information concerning a method of making these washers flat?

A. There is only one way to straighten the steel washers which you have made, and that is by tapping them with a hammer on a large steel anvil. Your problem is identical with that experienced in the making of cotton gin saws, which are made of hard-temper steel and not hardened. These saws must run absolutely true on the shaft. They are made from carefully selected steel, and after blanking, every one is straightened by hand on an anvil.

If the steel is too soft or too hard, it will not straighten satisfactorily. The makers have never found anything to replace the hammer method of straightening. This job of straightening the disks which are of about the same thickness as your washers, requires practice and some degree of skill. In this respect, it very much resembles the straightening of rifle barrels, which is also done by hammering. A skilled man can size up the disk on the anvil and straighten it with one or two well-directed blows, whereas an unpracticed man might aim the blow in the wrong place and make it worse.

· TECHNICAL · ABSTRACTS ·

The Coming Trade Conflict in the Far East

The outstanding feature of our postwar commerce, so far as its general acceleration is concerned, is the literally astounding growth of transpacific traffic. The rate of its advance has far exceeded that of any other branch of American trade.

Of the ten countries in which our trade is growing most rapidly, seven lie within that vast semicircle from New Zealand to Japan and westward as far as India—a territory which comprises markets peopled by uncounted millions, great areas comprising new and almost untouched resources and latent potentialities in trade and industry.

Whereas our Latin-American exports have grown about 2½ times in value since 1913, and have in that time risen in the proportion which they represent of our total exports from 15 to 19 per cent, our Far Eastern sales in the meantime have multiplied over 4½ times and have nearly doubled their relative importance in our overseas trade, having risen from 6.7 per cent of our total sales abroad in 1913 to 13.5 per cent last year. The value of this traffic was $735,000,000 in 1927.

It is self evident that some analyses of the possibilities of curtailment or modification through European competition are of rapidly increasing significance to our merchants and manufacturers. In fact, our commercial interests are reviewing with increasing alarm the various aspects of this problem.

It is well to note the cause of this extraordinary development of our eastern trade since 1913. The gains which we have won have by no means been taken over entirely from our European rivals because of their wartime preoccupations and the heavy burdens of their postwar reconstruction. Although in certain lines and markets we stepped in as a replacement for their traders, the great bulk of our gains since 1913 has been in typical American products in which Europe was never a prominent dealer. Two examples are automotive products and tobacco.

An analysis of the statistics of European trade with these lands brings out very clearly the fact that our increasing activity has not in the least impaired their recovery and further progress. In fact, our European friends have also profited by the enormous strengthening of buying power throughout the East. Both England and Germany have not only held their own, but have actually made some moderate progress in the proportion of the total of their export trade in the Pacific.

In general the causes of the impressive advance in Far Eastern trade as a whole have been chiefly the economic awakening of those regions, due partly to the stimulation of their war-born nationalism, which was partly a result of enforced economic isolation and the consequent encouragement of many new industries. Then, too, there has been a tremendous increase in the purchases of their raw materials, particularly by the United States, to meet the demand of the rapidly growing industries and of steadily advancing standards of comfort. Another cause of Far East awakening is the fact that there is an increase in production in those regions of more than ten times since 1913, so that now its value totals over one billion dollars a year. Furthermore, American equipment used in these countries rather than curtailing trade has caused a very substantial growth in American exports due to the new purchasing power which is evident. — Julius Klein, *Magazine of Business,* April.

Supervisors of Grinding Wheels

In a number of large plants where substantial quantities of abrasive wheels are used, so-called supervisors of grinding wheels have been appointed. Briefly stated, the duties of a grinding wheel supervisor consist of keeping records of the wheels used and their application, following up tests of trial wheels and noting the results, making out requisitions for the purchasing department so that the stock may never run low, and directing the activities of the department wherein grinding wheels are bushed, balanced and salvaged. The supervisor should be a man of experience, with a comprehensive knowledge of abrasives and their uses, for upon his shoulders falls the burden of keeping abrasive costs at a minimum.—Fred B. Jacobs, *Abrasive Industry,* May.

Diamond-Boring Connecting Rods

Diamond tools are becoming increasingly popular in automobile plants for boring the bearings of connecting rods because of the high degree of accuracy easily obtainable by their use. In a mid-western plant where high grade engines are manufactured both the bronze and the babbitt bearings of such rods are bored simultaneously. An outstanding feature of the method is that the two bearings are not only produced within the close limits specified, but the bearing surfaces are 90 per cent correct bore, as determined by "wringing" them on lightly blued plugs.

The special machine on which the diamond boring is done is equipped with two high-speed ball bearing spindles. Approximately 0.012 in. of stock is removed from each bearing. On a typical rod the 2.125 in. diameter babbitt bearing hole is bored at a speed of 965 ft. per min., with a spindle speed of 1,735 ft. per min. and a feed of 0.0014 in. per revolution. The 0.875 in. diameter bronze bearing hole is bored at the same lineal speed; the spindle running at 3,470 r.p.m. with a feed of 0.0007 in. per revolution.

The hardness of the diamond is proverbial, and while it is true that there is no metal that cannot be cut with it, it is also true that the hardness of diamonds is associated with the same brittleness that is characteristic of most materials possessing unusual hardness. This brittleness renders the diamond tools likely to have their cutting edges shattered by shocks or impacts, although when held and rotated in a manner that prevents unnecessary shocks their life is almost unbelievable. Diamond tools are seemingly not affected by the heat generated in cutting, and the rate at which they may be operated is usually limited by conditions other than cutting speed. On bronze and babbitt a better finish is obtained as the cutting speed increases.—*Machinery,* April.

Box-Counting Devices for Gravity Conveyors

Although accurate and positive counting of boxes and cartons moving on gravity conveyors is not by any means new, it is apparently unknown even by some manufacturers of conveying equipment. In applying a counting mechanism, a point is selected such as at the discharge of an elevator. At a distance not more than 10 ft. beyond the elevator, the gravity-conveyor line is broken and lowered, so that there is a drop of about 1 in. or less. A contact wheel about the diameter of the rollers, supported on a vertical arm through a slotted plate and attached to the counting device, projects to the level of the rollers of the first section. When a box passes over the drop in the level of the two sections, the small wheel is depressed. The wheel is released when the end of the box passes by it, since the succeeding box has its front end at the upper level until its center of gravity passes the last upper-level roller. The counter-wheel depressions are recorded by the counting device.

Another device which is electrically operated and which is intended to furnish information at a remote point can be arranged upon a suspended frame over the mechanism previously referred to. The rollers suspended from the electrical device just leave the top of the package as the mechanism below records. This sychronized counting permits persons immediately concerned with the conveyor system and also executives at remote points to know exactly what quantities of materials have been handled.—P. T. Van Bibber, *Industrial Engineering,* April.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Business Examines Itself

BUSINESS examined itself at Washington last week at the annual session of the Chamber of Commerce of the United States. It discovered opportunities for self improvement, but discovered the direction toward sounder action, as well. If every business man could move on to Washington to the meetings of this great clearing house of business principles and ideas, there would be no excuse for impractical, non-ethical, non-profitable business practice.

However, that will never be. The rank and file of business is dependent upon returning delegates for a share of the understanding of vital problems and the spirit of progress so evident at Washington. There was an abundance of both, tied in with a program analytical and constructive, following the keynote, "Teamwork for Prosperity."

Consider a few of the many strong guides given for the use of business:

1—It is one of the responsibilities of business to purge itself of those pirates whose acts stigmatize and bring business into disrepute.

2—The trade association has come to be a highly important part of business—and a powerful part. It will eventually refuse to receive as a member, or will expel, an organization that wilfully violates fundamental principles of sound business.

3—Foreign trade is a serious and permanent venture—not a refuge market.

4—The "big unit" in business has only just begun.

5—There is dire need of a business program in legislation. Machinery must be formed to acquaint the business man with the successive steps of legislative acts. All new legislation must be fitted into existing legislation. It is one of the duties of trade associations to keep business advised as to proposed legislation and in touch with its progress.

6—It is vital that business supplant the craze for volume (when not accompanied by sufficient profit) by the objective of reasonable profits.

7—Positive action must be taken to eliminate buyers' profiteering and sellers' price cowardice. These steps should include the insistence by sellers on seeing all submitted prices when price concessions are demanded; and the adherence by sellers to the principle of not cutting prices after they are submitted as a quotation.

8—Forecasting and planning are essential. This business activity was defined as a system of control whereby production, purchases, and the employment of capital are co-ordinated with sales requirements.

9—The day of integrated mass trade effort, as a sequel to mass production, is at hand.

Many other indicators of the proper business paths to follow were established. The problems involved in these nine subjects, however, are considered vital to the metal working industries. Action is needed. Let the Chamber point the way—let the delegates take these directions back home—let individuals believe in them—still nothing will happen without concerted action, without teamwork for prosperity, for which the Chamber this year has worked hard and faithfully.

From Research Laboratory to Manufacturing Plant—How Long?

A NEW yardstick for measuring the relative industrial efficiency of nations has been found in the extent of the time lag between the discovery of a scientific principal in the research laboratory and the application of that principle in industry. In one of the first four countries of the world, as measured by their respective research activities, the lag is fifteen years. In another it is from two to three years. The relative efficiencies measured by other means correspond rather closely to the terms of this comparison.

Research in the field of pure science is vital to industrial progress, and deserves every bit of support that can be enlisted for it. But it must be remembered that abstract physical principles become useful only when set to work in industry.

Where a nation will be five or ten years hence is indicated by the nature and extent of the work now going on in its research laboratories. How soon it will get there depends upon its energy and ability in reducing theory to practice. And the same reasoning applies to an industry, or to a company or to an individual.

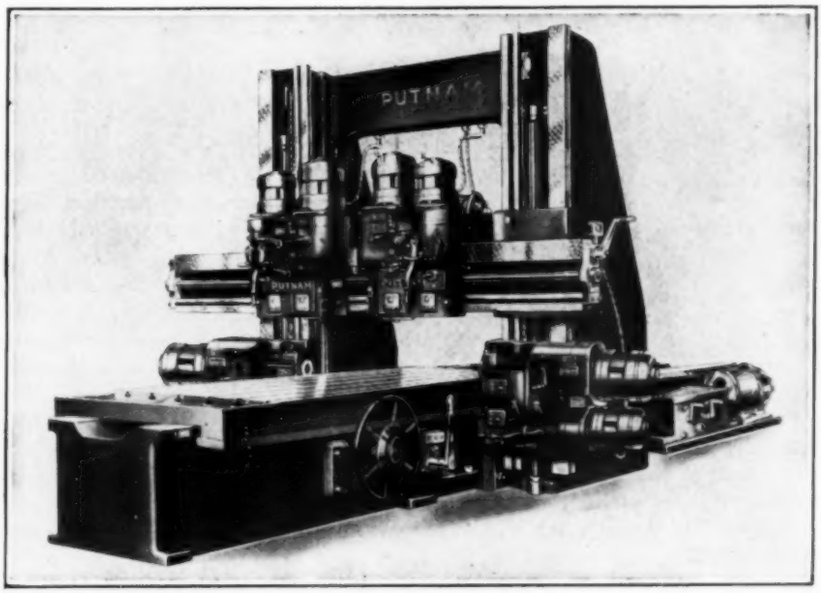
· SHOP · EQUIPMENT · NEWS ·

Putnam Unit Milling Head

INDIVIDUAL needs can be met by this unit milling head that has been developed by the Shaw-Crane-Putnam Machine Company, Inc., Fitchburg, Mass. It is being marketed by Manning, Maxwell & Moore, Inc., 100 East 42nd St., New York. Not only is the horsepower of the driving motors subject to change, but the range of feeds and speeds can be altered also. Furthermore, it is possible to adapt this equipment to existing planer-type milling machines so that wasted power resulting from the use of shafts, gear boxes and other necessary appendages may be eliminated.

The illustration shows the application of four of the unit heads to a planer-type milling machine. Note that push-button control is easily accessible to the operator, and that the similarity of controls on all four units makes for faster and more accurate handling. Power is furnished to each head through armored cables. The two lower heads are arranged for milling in the direction of table travel, whereas the two upper heads mounted upon the rail are arranged for profiling. The former arrangement permits work to be milled up to the full width of the table, while the latter allows profiling operations to be extended beyond the table width, depending upon the length of the rail. Such an arrangement permits the handling of very large work of irregular shape.

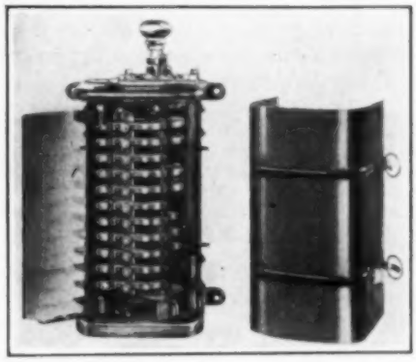
The machine illustrated is provided with milling heads having sixteen speeds in either direction, twelve feeds in either direction on rail or housing and twelve feeds of the quill. Rapid traverse along the rail and for moving the quill are incorporated in the design. It will be noted that all of the selective gear mechanism is completely inclosed thus not only eliminating hazards, but providing the means for flood lubrication. All spindles are mounted in Timken tapered roller bearings to insure accuracy and long wear, and to permit the motor to be mounted either vertically or horizontally. Drive gears are of the helical type throughout.



Four Putnam Unit Milling Heads applied to a planer-type milling machine

General Electric Primary-Resistance Drum Switch

This primary-resistance drum switch, bearing the designation CR-3,200-1,250, was designed for use with squirrel-cage induction motors on small cranes, hoists and machine tools. It has been introduced by the General Electric Company, Schenectady, N. Y., and is of the primary-reversing type with the capacity rated in horsepower. It is designed for wall mounting and can be furnished with a standard conduit box.



General Electric Primary-Resistance Drum Switch showing arc suppressor assembly

Two forms of this switch are available; CR-3,200-1,250-B, is suitable for hoists where the motor is overhauled in the lowering direction, and CR-3,200-1,250-A is suitable for hoists when the motor is not overhauled in the lowering direction. An example of the former is a hoist with spur gearing and no automatic mechanical load brake. An example of the latter is a hoist using low-efficiency worm gearing or an automatic load brake. The CR-3,200-1,250-B provides four points for hoisting and one point for lowering. The CR-3,200-1,250-A provides four points forward and four points reverse. It is designed for use with machine tools or general-purpose applications.

The switches are built without operating mechanism. The dial plate for the horizontal handle is assembled with the drum switch, and is removed and discarded when the vertical handle or rope wheel attachment is to be used. This change involves only the removing and replacing of four screws from the dial plate.

The switches may be obtained with dust-tight covers for cement mill or similar service where the equipment will be subject to excessive non-explosive dust. Such covers are constructed with a felt gasket riveted around the edges. They are tightly fitted to the switch frame, and all openings in the frame, including the conduit box, are sealed with compound.

A suitable resistance, furnished

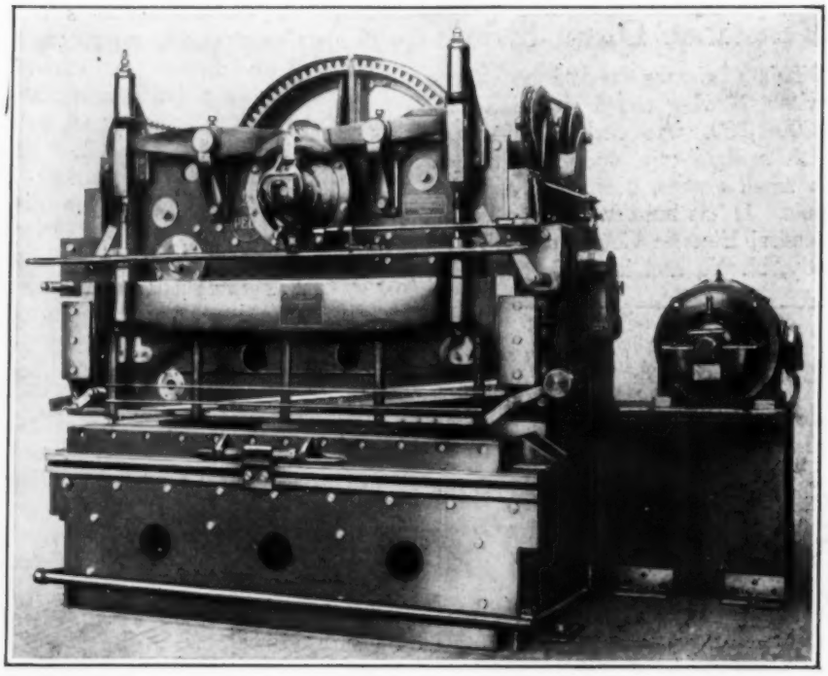
separately, provides approximately 50 per cent of full-load rated torque on the first point of the switch. The torque obtainable on the other points of the switch can be adjusted over wide limits by shifting the taps in the resistor. The switches are designed for operation on maximum primary voltages of 550 and have a rating of 15 hp. for 2- or 3-phase motors.

Pels Types STA, STAQ and STAU Gate Shears

THREE gate shears, Types STA, STAQ and STAU, built in sizes to shear up to 2-in. plate have been introduced into this country by Henry Pels & Company, Inc., 90 West St., New York, N. Y. Type STA has extra long knives for splitting and trimming, Type STAQ is equipped with cross knives and Type STAU is a universal gate shear having adjustable rake and cross knives. All of these machines have frames constructed from steel plate. Three depths of throat may be obtained in each, namely 12, 24 and 30 in. Shearing lengths vary from 40 to 144 in. by increments of 20 inches.

Type STA in addition to shearing plates of a certain thickness and width, will also split or trim plates of unlimited length, to the limit of the throat depth. Plates of any length can be fed parallel with the knives. The upper knife is so long that its end stays clear of the plate when the knife has reached its lowest position, thus eliminating any tearing of the plate at the end of the knife.

Type STAQ is equipped with cross knives located at right angles to the main knives for automatically removing at each stroke the scrap strip when trimming long plates. This facilitates a quick and easy feeding. The cross knives are out of action during normal shearing and are brought into position for trimming by lowering the upper cross knife together with the main upper knife. The required adjustment consists of a half-turn of an eccentric pin, with a socket wrench. A further feature is that corners can be quickly and accurately cut out of plates by the joint action of main and cross knives.



Pels Type STAU Gate Shear

When the inclination, or rake of the upper knife slide of the type STAU machine is increased, the machine can be used to shear steel plate heavier than normal capacity. The adjustability of the slide also permits the use of smaller degrees of rake than normal, where it is important that the pieces cut off remain perfectly flat, and the edges of plates of the sizes specified can be beveled at 15 deg. If smaller rake is desired adjustment is made by a crank.

These machines are of an extremely heavy type of construction. The frame is made of heavy, rolled steel plates of special analysis and heat-treated. The connecting bolts are completely relieved of all shear stresses. The gears are inside of and protected by the frame, and do not interfere with operation. All gears have machine cut teeth and the pinions are cut from solid steel forgings. Shafts, particularly the eccentric shaft, are very short and there is little possibility of twisting. The eccentric shaft and upper knife slide are connected by one plunger on 40-in. shears. Two plungers and connecting rods are used on 60-in. and larger shears.

The counterbalanced knife slide travels in wide housings with adjustable gibs. Adjustment of the lower knife holder to the upper knife can be made for clean shearing of thin plates on the heaviest shears. The holddown is fully automatic and does not require adjustment for cutting plates of varying thickness, and it affords an unobstructed view of the knives in any position. The holddown arms swivel and are self adjusting to unevenly thick or warped plates, thus assuring positive clamping of any plate.

Accidental Tripping Prevented

The clutch is operated by foot trip and disengages automatically upon completion of the stroke, or can be locked for continuous operation. Provision is made to insure full mesh of the jaws and to guard against backlash. The treadle can be locked to guard against unintentional tripping.

The flywheel on the larger sizes is fitted with a coupling and shearing pin to protect the moving parts from damage in case of overload. The bearings for all shafts are of phosphor-bronze and are of ample dimensions. Shafts and bearings are precision ground. The flywheel shaft bearings have ring oilers.

In nearly all cases the knife is about 5-in. longer than the length of

the sheared plate while the distance between housings is usually 3-in. longer than the length of the sheared plate. The strokes per minute for the ¼-, ½- and 1-in. plate machines are 30, 24 and 20, respectively, for a 40-in. length of shear. Naturally, the number of strokes per minute decreases as the length of shearing increases for any given thickness. The power required for a ½-in. plate machine having a 40-in. length of shear is 5 hp., and for the 144-in. shear it is 15 hp. Whereas the power required to shear ¼-in. plate, 40 in. long, is but 5 hp., that required to shear 1-in. plate, of the same length, is 35 hp. All of the above power requirements should be increased by 25 per cent for direct motor drive.

Cincinnati No. 120 All-Steel Press Brake

RIGHT-ANGLE bends may be made at one stroke by means of the No. 120 all-steel press brake, which has ben introduced by the Cincinnati Shaper Company, Cincinnati, Ohio. Standard lengths of machines furnished in this series range from 6 ft. 6 in. between the housings with a die length of 8 ft., to 12 ft. 6 in. between the housings with a die length of 14 ft. One of the series is shown in Fig. 1. The bends can be made in ⅜-in. steel plate, 8 ft. long, over a 3-in. die opening, or ¼-in. steel plate, 12 ft. long, over a 2-in. die opening.

The manufacturer has been using rolled steel plate in the manufacture of these press brakes for a number of years, but the construction of this machine is different in that the housings are made of a single plate, 4¼-in. thick, instead of the previous double-plate, box construction. Formerly it was necessary to use two 2-in. plates welded and riveted together to build a housing of the requisite thickness. The bed and ram plates are 3-in. thick, and the bed extends below the floor line from 18 to 28 in., depending upon the length of the machine to secure a safe anchorage.

Due to the method of mounting the bed, and the construction of the divided connecting rod, shown in Fig. 2, the loads are carried directly up and down the center line of the housings. This feature is designed to minimize deflection and, at the same time, give greater capacity with the same factors of safety.

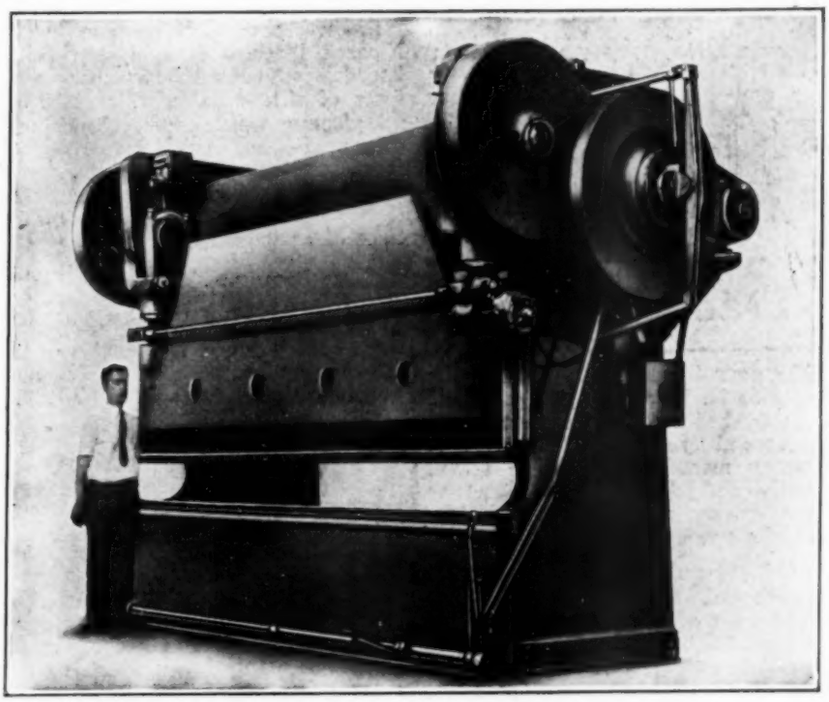


Fig. 1—Cincinnati No. 120 All-Steel Press Brake showing steel plate construction and ram drive

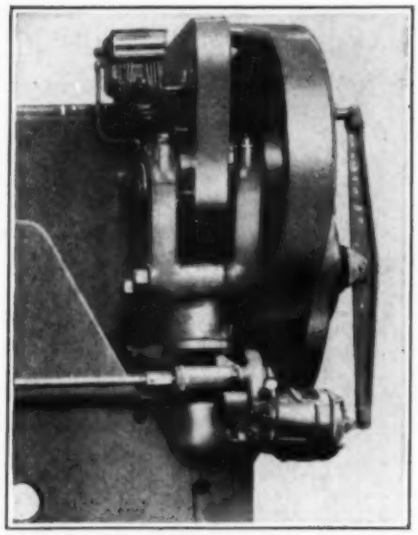


Fig. 2—The divided connecting rod shown is designed to minimize deflection

Other refinements built into this series are automatic oiling, anti-friction bearings on high-speed shafts, and in the mounting of the flywheel, special disk-clutch, large over-size brake drum, liberal depth of bed and ram plates, and screws of high-carbon, high-nickel steel, cut with buttress threads. In addition, a dovetail slot is planed along the length of the bed, both front and back, for attaching gages or other fixtures.

The ram is raised and lowered with an independent motor drive, which is standard equipment. The flywheel receives energy from the electric motor connected to it by a Texrope drive.

Ingersoll Improved Cutter Grinder

MILLING cutters may be ground in a single setting on the improved cutter grinder shown, which has been placed on the market by the Ingersoll Milling Machine Company, Rockford, Ill. This feature is made possible by the fact that the spindle is always in the same plane with the axis of the cutter, and at the same time can be set at different angles to that axis, or can be rotated in an arc over the cutter. The grinding which is done dry is always visible due to the open type of construction. Cut-

Ingersoll Improved Cutter Grinder

ters from 5 to 30 in. in diameter can be handled that have peripheral faces from ½ to 7 in. in width. The face of the cutter may be placed at a maximum of 8 in. from the spindle.

The cutter to be ground is carried on a spindle which is mounted in ball bearings in a quill held vertically in a saddle. This saddle slides horizontally on hardened and ground ways in the base of the grinder. It has a 15-in. adjustment on these ways, and the spindle quill provides a 4-in. vertical adjustment. These movements are made by handwheels at the front of the machine which are graduated in thousandths of an inch, and by them, cutters of different sizes may be brought up to the proper position for grinding.

The grinding wheel spindle is mounted on a hardened-steel slide which moves on ways in a U-shaped yoke. This yoke is pivoted on a horizontal axis, carrying the wheel spindle over the cutter spindle, but keeping it in the same plane with the axis of the cutter spindle. It has a range of 96 deg. and carries the wheel spindle from 3 deg. below horizontal to 3 deg. past vertical. The yoke is mounted on anti-friction bearings and is counterbalanced. It can be rotated easily or can be clamped in position to grind at any angle within its range. The motor is built into the wheel slide and drives the spindle through an internal-reduction gear cut on its end, eliminating all belts and pulleys. The motor, spindle, and reduction gearing are inclosed in a dust-proof housing and are mounted in anti-friction bearings. Either d.c. or 60-cycle a.c. motors can be supplied. The wheel, which is 10 in. in diameter, is revolved across the tooth toward the cutting edge. Grinding is accomplished by moving this wheel along each tooth by means of a hand lever. The wheel is ½-in. thick, and has a 1-in. arbor hole. The corners may be ground square, at an angle, or within any radius up to 2¼ in. Cutters with solid shanks may be ground, as the cutter spindle is fitted to hold an Ingersoll "M" taper shank, which is 3¼ in. in diameter and 10¼-in. long. The taper shank fits the ground hole in the cutter spindle, thus locating the cutter in the same way as it is located on the milling machine spindle. The machine weighs 1,650 pounds.

Trade Catalogs

FLEXIBLE SHAFTS. N. A. Strand & Co., 5001 N. Lincoln St., Chicago, Ill., has published a 48-page catalog covering several types of machines. The company manufactures flexible shafts, grinding and polishing machines, power screw drivers, nut setters, rotary files and filler rubbing machines for wood.

G. E. PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has issued a set of publications on various products. Bulletin No. GE-233-B gives the ratings and operating characteristics of centrifugal air compressors of the single-stage type. Bulletin GEA-308A describes arc-suppressor plates for drum controllers. Publication GEA-752 shows the constructional features of the type BD direct-current motors for both constant-speed and adjustable-speed uses. Bulletin GEA-835A contains descriptions of d.c. magnetic controllers covering types CR 4,066, CR 4,068, CR 4,166 and CR 4,168 for constant-speed and adjustable-speed motors. Bulletin GEA-894 contains a description of adjustable-speed d.c. motors of type CD. Catalog GEA-934 discusses type CR 7,896 automatic throw-over panels for currents from 30 to 2,000 amp. at 600 volts. Bulletin GEA-948 describes type CR 4,065 d.c. magnetic controllers for constant-speed motors for loads from ¾ to 10 hp. at 115 volts. Publication GEA-950 describes type CR 1,028 a.c. inclosed starting rheostats, for use in conjunction with primary switches for slip-ring induction motors.

MILL MOTORS. The General Electric Co., Schenectady, N. Y., has published catalog GEB-63 which is a brief review of the standardization of type MD-400 motors, which have been designed for mill use. The features of the new design are discussed, and many uses are listed. Several photographs illustrate the new motors and their applications. The catalog contains 16 7x5 in. pages.

RIVETING MACHINES. The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill., has issued a bulletin entitled "Rivet It." The company's riveting machines are shown in use upon such structures as gas tanks and skyscrapers. Several of the available machines are illustrated. The bulletin contains four 11x8-in. pages.

SHEET-METAL MACHINERY. The Niagara Machine & Tool Works has issued Bulletin No. 100 showing several types of sheet-metal machinery of its manufacture which include bench machines, folders, crimpers, groovers, formers, shears, punches and small tools. The booklet is illustrated throughout and contains tables of the sizes of equipment mentioned.

SPEED REDUCERS. Winfield H. Smith, Inc., Springfield, Erie Co., N. Y., has issued a catalog describing its line of speed reducing mechanisms. These are all of small size. They are illustrated and dimension sheets are included. The booklet contains 17 7x3½-in. pages.

STARTER. The Monitor Controller Co., Baltimore, Md., has published Bulletin No. 112 describing its line of "Thermoload" starters. The ratings of these starters may be varied by interchanging the thermal units. Several illustrations are used in an effective description of this starter, and a curve is used to show the tripping time at various overloads. Tables are given of the ratings, dimensions, and weights. The bulletin contains 11 11x8½-in. pages. pages.

NEWS OF THE WEEK

United States Chamber of Commerce Urges

"TEAMWORK FOR PROSPERITY"

Harris & Ewing

WITH an attendance exceeding that of any previous meeting, the sixteenth annual session of the Chamber of Commerce of the United States was held May 8-11 in Washington. In addition to the record-breaking attendance, the proportion of outstanding figures in the business world present was greater than ever before.

Sound advice for the business men of the metal working industries came out of this meeting of the chamber. Prominent among the important principles established were these:

The trade association has come to be a highly important part of business—and a powerful part. It will eventually refuse to receive as a member, or will expel, an organization that wilfully violates fundamental principles of sound business.

Positive action must be taken to eliminate buyers' profiteering and sellers' price cowardice. These steps should include the insistence by sellers on seeing all submitted prices when price concessions are demanded; and the adherence of sellers to the principle of not cutting prices after they are submitted as a quotation.

It is necessary that business supplant the craze for volume (when it is not accompanied by sufficient profit) by the objective of reasonable profits.

The "big unit" in business has only just begun.

There is dire need of a business program in legislation. Machinery must be formed to acquaint the business man with the successive steps of legislative acts. All new legislation must be fit into existing legislation. It is one of the duties of trade associations to keep business advised as to proposed legislation and in touch with its progress.

Foreign trade is a serious and permanent venture—not a refuge market.

It is one of the responsibilities of business to purge itself of those pirates whose acts stigmatize and bring business into disrepute.

The day of integrated mass trade effort, as a sequel to mass production, is at hand.

A feature was the address of Judge Edwin B. Parker, the chairman of the Chamber's Board of Directors, in which he urged business to purge itself of that small percentage of "pirates" which tends to bring the whole into disrepute. It is they, he declared, who break down public confidence and who provoke government regulation. They are more dangerous than all the radical agitators, he asserted.

Business Must Purge Itself, Says Judge Parker

Because of recent scandals associated with men prominent in high business circles, Judge Parker stated that "America and American business are on trial before the world" and he challenged organized business to "cast the beam out of its own eye and set its house in order."

"Just as nations will decline to recognize a government committed to destroying the foundations of civilization," he said, "and just as the legal and medical professions purge themselves of unethical practitioners, so will business decline to recognize as a member of the profession of business, and trade associations will decline to receive into their ranks, or will expel, an individual or an organization that wilfully violates the fundamental principles upon which sound business rests, or that persists in ignoring the decencies of business intercourse, and besmatters all business with the slime of corruption or with the muck of unclean practices."

Government regulation of business and government ownership of businesses also were scored by Judge Parker.

"Among the responsibilities of business," he stated, "is to see to it that the profession of business is purged of those pirates whose acts stigmatize and bring business generally into disrepute. Such individuals, unmindful of their duties to the public, inevitably bring upon themselves and the entire institution of business the thunderbolts of public wrath in terms of legislative and governmental regulation which hamper a legitimate freedom of initiative. Ruthless and selfish initiative must be curbed in the public interest and in the interest of legitimate business."

President Pierson Maintains Tax Position

Lewis E. Pierson, the president of the Chamber, came out unequivocally for the maintenance of the Chamber's position on tax reduction. "That position," he declared, "was sound when your committee made its recommendations. It was sound when the membership, by an almost unanimous vote, endorsed it. Nothing has occurred since to modify it. It is sound today. The Chamber is committed to the position that government income and that government expenditures should substantially balance. Large surpluses are an inducement for demands on Congress for extravagant spending."

Trade Associations Have Strong Position

That the trade association has come to be a highly important part of the Chamber's membership was brought out

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Judge Edwin B. Parker
Chairman of the Board of Directors
U. S. Chamber of Commerce

strikingly at this meeting. It is apparent that these organizations have become an important part of the foundation upon which the national Chamber rests, and in time will, in the opinion of many in attendance, displace to a certain extent the local chambers of commerce that frequently are civic rather than business institutions. Much credit was given to Hugh Baker for the very effective manner in which he has organized the Chamber's new trade association department.

Redfield on Foreign Trade

Under careful analysis, the factor of labor cost is usually one of the smallest factors in production. The high wages paid in the United States offer no reason why the American manufacturer cannot compete and succeed in the foreign market. These opinions, based on personal experience, were advanced by William C. Redfield, ex-secretary of Commerce, who urged his hearers not to take a flier in foreign trade but to consider it as a serious and permanent venture. The finish, quality and design of American-made goods usually makes price a question of secondary importance, but the manufacturer should not use the foreign market as a dumping ground for excess production. He should consider less the problem of selling what he wants to sell, and study, instead, what his customer wants to buy.

Mr. Redfield cited the responsiveness of the American workman to leadership as an overwhelming advantage. Success in the foreign field, he declared, depends on whether or not the manufacturer has faith in himself, faith in his men and faith in his goods. If so, he can find ample opportunity for expansion abroad if he enters the foreign field with the intention of staying in it, changing his own policies and practices from time to time to conform to a new knowledge of the needs of his customers.

Mass Trade Effort Essential, According to Klein

The day of integrated mass trade effort, as a sequel to mass production, is at hand, according to Julius Klein, Director, Bureau of Foreign and Domestic Commerce, Department of Commerce, who spoke on "Foreign Trade Combinations." The situation, he says, calls for sober factual analysis, calm planning, and courageous action; not emotional patrioteering on the one hand or supine defeatist submission on the other.

It was hoped that in the Webb-Pomerene combines had been found the answer to foreign collaborative competition, but a decade of the operation of that act has revealed unexpected obstacles. Although some fifty-seven export associations are registered, only a small proportion are actively operating. Their total export trade in the last fiscal year was about $200,000,000, a third of which was supplied by metals and minerals, another third by forest and food products, and the remainder by miscellaneous manufactures and partly processed goods.

The bulk of the commodities availing themselves of the privileges of the act were raw materials, whose uniform character made them readily susceptible to such consolidated handling. Particularly in regard to the raw materials mentioned, this type of trade device seems to have served a useful purpose.

Barnes Attacks McNary-Haugen Bill

One of the features of the meeting was a smashing attack by Julius H. Barnes on the McNary-Haugen bill. He characterized the legislation as a futile panacea, which, if enacted into law, will break prices down and soon will go the way of the British rubber effort and will leave the farm exposed to distress worse than before. The day will come, he predicted, when members of Congress who voted for the measure will thank the President for preventing its enactment into law, thereby allowing farm revival to continue. Had this not been done, the legislation would have destroyed the existing marketing system, which has made possible the very marked recovery of agriculture. He pointed out that the average farm price now is 168 per cent of pre-war, while the average price of all commodities is 144 per cent of the pre-war price.

Strawn Urges Business Men to Study Problems of Government

"There can be no civilization without order and no order without law," according to Silas H. Strawn, chairman of the board, Montgomery Ward & Company. He said that the greatest peril to this country today is the indifference and apathy of our business men toward the problems of government, and that if business is to continue to prosper business men must give more attention to what is going on in congress and the legislatures.

Mr. Strawn predicted that the age of the "big unit" has only just begun, and that in the future the problem of our Congress and legislatures should be how such units can be regulated and controlled so as best to serve the people. He pointed out certain legislation now before Congress that, if passed, will be seriously detrimental to business, and emphasized that, while no business man can be expected to know all that is going on in the Congress or legislatures, he should know about such legislation as is directed toward not only the destruction of his business but also the very stability of our government.

Young Wants a Business Program in Legislation

That a business program in legislation is seriously needed was the gist of an address by Benjamin Loring Young. Mr. Young advocated the introduction of machinery for acquainting business men in particular and the public at large with the successive steps of legislation as it is proposed and while in process of enactment. He plead for a requirement of executive budgeting and the fitting of new legislation into existing legislation. To illustrate the benefits accruing from his proposed program he told of results achieved in Massachusetts, where such a program is now in operation. Since 1921 the state debt has been decreased from 34 to 14 millions, while debts in other states have been increasing from 250 to 300 per cent. During the same time a soldiers' bonus of 20 millions and the current expenses were paid.

It was suggested that an important phase of the work of the trade associations and of the local Chamber of Com-

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Louis E. Pierson
Retiring President
U. S. Chamber of Commerce

merce is to keep business advised as to proposed legislation and in touch with its progress.

Adams Suggests Further Tax Reduction

Condemnation of Secretary Mellon's plan of applying Treasury surplus to reduction of the public debt was expressed by Professor Thomas S. Adams, of Yale University, at the Wednesday meeting of the Finance Department of the Chamber.

Professor Adams advanced the conviction that such surplus funds should be used to reduce taxation.

"There will always be a surplus of funds," Professor Adams stated, "and there is no present need of saving for the future. The public debt will be entirely written off by 1950. The present generation, therefore, should receive the benefit of present prosperity through reduction in taxes."

Professor Adams suggested that the present corporation tax be reduced to ten per cent. "The rate of taxation," he stated, "should depend upon the Treasury reports issued each June. If a surplus then occurs, the September taxes should be reduced accordingly. Correspondingly, if a June deficiency occurs, the September taxes should be raised. Present taxes should be adjusted downward to meet present conditions.

"If future conditions make higher taxes necessary the taxes can be raised at that time. It is useless to attempt to make present tax rates meet nebulous future conditions which may or may not materialize."

Mehren Advocates Teamwork for Profits

At the meeting of the Manufacturing group, E. J. Mehren, vice-president of the McGraw-Hill Publishing Company, in an address "Teamwork for Profits in a Buyers' Market," proposed that (1) we supplant the craze for volume by a reasonable passion for profits, and (2) that we eliminate buyers' profiteering with its accompanying price cowardice. Mr. Mehren said, in part:

"At the very root of our difficulties lies the craze for volume. We'd sooner have volume than profits. A full factory and red ink seems as popular as 60 per cent operation and plenty of black. Crazy for volume. Swollen sales expense to get the last 20 per cent of business. Runious prices to fill up the factory. The goal is volume, not profits.

"We fail to realize that the law of diminishing returns cannot be flouted. The nearer we get to perfect performance the smaller the gain for given effort. It can't be escaped. The top business costs more than it is worth and only injects an undesirable color scheme into our balance sheets. Some men refuse to acknowledge the law and even after they land in the bankruptcy courts fail to realize that it was the expenditure of two dollars to get every dollar of top sales that 'put them on the blink.'"

As remedies for buyers' profiteering and price cowardice, Mr. Mehren offered two suggestions:

"Let all sellers insist on seeing all submitted prices when price concessions are demanded. The purchaser who is 'on the square' will show them. Business shouldn't be stud poker with all the cards turned down.

"Let all sellers determine not to cut a price or bid once it has been submitted. Do all your figuring in advance. Then stick by your price."

Forecasting and Planning

Another address delivered at the meeting of the Manufacturing group, important because of its wealth of detail, was that of Donaldson Brown, vice-president of the General Motors Corporation, under the title, "Forecasting and Planning, Vital to Industrial Prosperity." The methods of forecasting and planning in use by the General Motors Corporation were explained.

Harris & Ewing

William Butterworth
New President of the Chamber of Commerce of the United States

According to Mr. Brown: "Forecasting and planning is nothing more nor less than a system of control whereby production, purchases of materials, and the employment of capital are co-ordinated with sales requirements. Budgetry control is an apt phrase except that it is likely to imply a rigidity that must be guarded against. Flexibility is a prime requisite so that there may be a quick response and thus the possibility of adjustment throughout the system to the requirements of changes of situation that are inevitable. The focal point of the system is the sales outlet. The flow at this point must be gaged and every other activity must be co-ordinated with it."

Scores Statements of Unemployment

Statements concerning unemployment, not predicated on fact, came in for denunciation several times, in particular by C. S. Ching, president of the American Management Association. He said: "Of late much has been said about our unemployment. Many who should know better have spoken of it as due to our improved methods and the introduction of machinery. According to this theory labor conservation is not necessarily a blessing and one who advocates it would first have to justify his position.

"The idea that the introduction of new machinery and new methods throws men out of work is as old as industrial history itself. It would surely seem that the error of this belief has too often been proved for one to waste any time on the subject. One who gives the subject even passing notice should realize that the use of labor saving machinery and methods is the one thing which has raised man from the mere existence level to economic independence. Those who would limit or restrict it in any way are fighting against industrial progress and striking at the basic cause of our present high standard of living. A manufacturer who neglects it is courting business failure; a nation which forgets or denies its benefits is headed toward industrial stagnation. There is no cause to turn back and every reason to move forward.

"To argue otherwise is to follow a strange line of reasoning. If the introduction of the steam shovel takes jobs away from people, then we had better stick to the old fashioned hand shovel. . . . What goes for the steam shovel is equally true of all those sound modern devices by which we attempt to increase production and lighten the load of labor."

New Officers

William Butterworth, of Moline, Ill., was elected president to succeed Louis E. Pierson, of New York. Joseph H. Defrees, of Chicago, was named chairman of the board, replacing Judge Edwin B. Parker, of Texas.

Mr. Butterworth is president of the John Deere Plow Co., and served as vice-president of the chamber last year. Mr. Defrees, a Chicago lawyer, is former president of the chamber.

Robert P. Lamont, of Chicago, was elected vice-president to succeed Mr. Butterworth. Three other vice-presidents named are A. J. Brousseau, of New York; Robert R. Ellis, of Memphis, and Paul Shoup, of San Francisco. Mr. Pierson becomes a member of the chamber's senior council, composed of five past presidents.

John Joy Edson, of Washington, was re-elected treasurer.

The general session before its adjournment elected the following directors:

Walton W. Crocker, of Boston; Ernest T. Trigg, Philadelphia; W. M. Wiley, West Virginia; Oscar Wells, Alabama; W. M. G. Howse, Kansas; Karl De Laittre, Minneapolis; Tyson S. Dones, Colorado; Wallis M. Alexander, San Francisco; W. H. Wattis, Utah; Frank L. Shull, Oregon; Felix M. McWhirter, Indiana; Henry D. Sharpe, Rhode Island; P. W. A. Fitzsimmons, Detroit; William Black, Kentucky; J. Perry Burrus, Texas; Fred W. Sargent, Chicago, and Frederick A. Haynes, Detroit.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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ON SATURDAY May 5 the Paris Bourse and the New York Stock Exchange were both closed so that their members' clerks would have time to catch up with their work. This simultaneous closing, for the reason specified, is without precedent. It furnishes impressive evidence of the scope of the speculative movement which now seems to embrace the world, including even Bombay and Tokio, as well as most cities of importance in the United States and Europe as speculative centers.

Of course each participant in the movement and each market has a different explanation to offer for the advance in security prices that has taken place. In New York it is American prosperity. In London it is the improvement in British trade that is anticipated, and in Paris it is the enthusiasm inspired by the prospective stabilization of the currency.

But for a phenomenon so universal there must be come common cause, and economists are now pretty well agreed that the common cause in the present instance is the expansion of credit made possible by the concentration of the available gold supply in the great central banks of the world.

Those who visited Europe before the war will remember that much of the money that passed through their hands or purses consisted of gold. Now the money in circulation consists entirely of paper. Gold is rarely seen and its use is discouraged even in those countries that are supposed to be back on a specie basis.

Since the end of 1913 there has been an increase of nearly $5,000,000,000 in the stocks of gold held by the central banks and governments of the world. The mathematicians have not yet been able to devise a formula by which one can precisely calculate the loan expansion made possible by such an amount. There are too many unknown quantities in the problem. It is, however, manifest that the permissible or potential increase must be enormous and a recognition of this fact, with its implications, is largely responsible for the complacency with which the gain in stock brokers' loans, or their equivalent, is regarded.

As long as this complacency continues, the optimism that now prevails seems likely to spread. This is what happened last week. The correlation between the stock market and the commodity markets was shown conclusively. They did not always move up or down simultaneously, but an increase of activity on the stock exchange was speedily reflected on the cotton exchange, and it is plain that the spirit of speculation is becoming more and more pervasive. The organization of an exchange where raw silk can be bought and sold for future delivery is evidence of this, and the so-called investment buying of sugar and rubber futures furnishes further proof that the public is ready to "take a flyer" on anything that seems likely to advance.

But while abundant credit and the cheerfulness it engenders give a double weight to what are called constructive developments, it is not to be inferred that the skies are entirely cloudless. There are indeed many incongruities in the situation. The steel industry, for example, appears to be slipping backward. Because pessimism is unpopular it is hard to get the facts, but prices are easier and the steel corporation reports a rather startling decrease in unfilled orders at the end of April. A smaller distribution of merchandise is also indicated by car loadings, which were more than 6 per cent under last year in the week ending April 28, and the Federal Reserve Board reports that retail sales for April were 8 per cent under last year.

In contrast to these cross currents in the commercial stream there is to be noted a reported increase in new building and an improvement in the lumber market. There is no boom in sight, but the ease with which municipal and state bonds can be sold makes it reasonably sure that there will be no unemployment during the summer, because all those who want work can find it on roads and public improvements that are in process of construction or authorized. Meanwhile it is worth noting that call money loaned at 6 per cent last Thursday, and that the Federal Reserve Bank of New York reported an increase of $79,000,000 in brokers' loans for the week.

In the news from abroad, the quarrel in which Japan and China have become involved takes first place. The merits of the question at issue and its implications are but poorly understood here, but the seriousness of the situation is attested by the decline in the yen as well as in the quotations for Japanese securities, and there are many who think that Japan means to reoccupy Shantung even at the cost of a war. But those who take this view are consoled by the thought that such a war would be almost bloodless, and that America would probably profit by the expenditure that it would involve.

In its international significance the flotation of an Australian loan for $50,000,000 by a syndicate of American bankers ranks second only to the Chino-Japanese affair. The promptitude with which the bonds were taken bespeaks the cordiality with which Australia is regarded in this country, and adds strength to the ties by which the community of English-speaking people is held together. This is of material as well as sentimental importance, for our investments overseas now exceed fourteen billion dollars.

WHAT'S DOING IN INDUSTRY

THROUGHOUT the country business in machine tools continues at a high level, although in a few centers a slight falling off in orders in the past fortnight has been noted. No fear is felt, however, that such declines will be permanent. From the tone of inquiries in all centers it is felt that a good volume of buying will continue. The National Machine Tool Builders' Association's index of orders in April indicates the maintenance of a high level of sales.

IN THE South on account of the unusually late spring, road building and other contractors' equipment has not sold up to expectations, but the outlook is excellent. In this section, the greatest sales activity has been in woodworking machinery, the furniture houses being the chief buyers.

GARAGES, small industrial plants and contract shops are furnishing a good market in Chicago, Indianapolis and elsewhere. Shops of all kinds are busy in the Detroit district, some of them because of work farmed out by Ford. The automotive industry as a whole is enjoying boom times and production is at a peak. This activity is reflected in other centers, although in Cincinnati a slight hesitancy in buying tools is noted on the part of automotive plants.

SMALL tools have been selling well for some time. Railroad buying in most instances has been light, although it is picking up in the New York market. Everywhere the bulk of trade is in single items, and large orders are infrequent.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

INDIANAPOLIS

Considerable spottiness seems to feature the machinery business here. Although some industrials appear to be rather ready buyers, others have curtailed their purchases to a minimum. A fair volume of inquiries, however, is being received. The automotive works appear to be the busiest at present. Virtually all of the factories in Indiana are producing at a rate at least equal to that of last year at this time and are buying accordingly. The same thing is true in the automobile body business, where orders are said to be more abundant than for the corresponding period of last year.

Dealers in electrical machinery are reporting a big volume of inquiries because it is known that several large additions and replacements are scheduled for this year by the public utilities in Indiana. The railroad buying is light, and it is believed that the carriers will cut their repair programs to the bone. The same situation prevails in the interurban business and, since none of the lines made profits last year, expenditures are being watched very closely.

A fair volume of business is now coming from the small garage and repair shops due to the spring influence. In fact, such buyers seem to occupy a better position than last year. Some good sales have been made in the construction field during the past two weeks which indicates that the demand for cranes, stationary engines and road-improvement equipment is improving. The demand from the steel trade continues disappointing with a rather dismal outlook.

Small machinists' tools are in greater demand now in the small shops as compared with periods earlier in the year, and, in addition, a good volume of inquiry is being received in this class of trade. Most business people are optimistic, since it is believed generally that the present dull period will be of short duration.

CANADA

Conditions generally in Canada are working out to the benefit of the metal-working industry in a most satisfactory manner. There is little doubt now in the minds of industrial leaders that the country has entered upon an era of expansion and prosperity that will be long lived. Machinery and machine tool manufacturers ought to reap a goodly portion of the promised harvest, according to developments of the last few weeks. Operations in iron and steel plants have quickened and expanded considerably; automobile production is increasing at a good rate; railroads are buying constantly, and there is a very good demand for structural and road building machinery.

Since the beginning of April sales in the metal markets have been good and specifications against contracts have been heavy. Practically all the consuming industries are well employed. The Dominion Iron and Steel Company is now operating 24 hours a day. Algoma is also running to capacity with orders on hand to occupy the next several months. One important point about the operations of Algoma is the fact that the company has attained within the past year a valuable diversity of products that makes it more or less independent of railway business.

An interesting development in the railroad situation is that the Quebec Government has authorized a subsidy of nearly half a million dollars towards the construction of a new railway in the Lake St. John district, to be built from Chicoutimi to Chibougama, a distance of 170 miles.

The automotive industry is interesting itself in new equipment, as are general manufacturing plants and firms making automotive parts. The March output of automobiles was 17,478, or 39 per cent over the February production.

CHICAGO

Last week in the machine-tool industry was without important changes. Business with most machinery houses was reported about the same as for the previous week, although in occasional instances sales were said to have shown a slight increase. Used tools continue in good demand, dealers in this line of equipment generally reporting a volume of trade considerably in excess of that for the corresponding period of last year, with good prices obtaining for tools of standard make. Inquiries are not quite as numerous as they have been, but they are of a character that indicates needs that must be met in the near future. Railroad buying shows little change, being limited for the most part to single tools. Builders of road machinery located in the Chicago district are expected to enter the market shortly for needed equipment, but no definite inquiries have been reported. Farm implement and tractor manufacturers continue as important buyers. The automotive industry is buying as its immediate needs require, but general industry and contract machine shops are said to be supplying the bulk of the orders.

NEW ENGLAND

A predominance of orders for single tools featured new orders in the New England machinery and machine tool fields. There is a dearth of new orders for heavy duty equipment just at this time; but small machine tools are selling as well, if not better than at any time this year. The current week has been more in line with expectations created by new inquiry. Builders of machinery are, however, busy with substantial order balances and any slight decrease in the number of orders placed has not been felt.

Grinding units are selling well, and there is a strong demand for small drills and lathes, as well as other cutting equipment for light shop work. Electrical manufacturers report a steadily increasing demand for motor equipment for single-drive machinery.

Expressions by representative manufacturers and dealers indicate that May will show an improvement over the April volume of business. There is every promise that it should. Industrial construction in all sections of New England continues at a high level. Included in the proposed work is a 6-story addition to the Fafnir company, New Britain, Conn., and a large machine shop addition at the plant of the Baird Machine Co., Stratford.

SOUTHERN DISTRICT

During the latter part of April and the early part of May machinery and machine tool business in the Southeastern district suffered a decline, the volume of sales being less than the dealers had expected with the exception of one or two lines, and also less than the corresponding period last year However, distributors express the opinion that this lull will be of temporary duration only, and that sales will pick up again before the end of May or at least by early June. Erratic weather is partly responsible for the decline in business, this having proven one of the most unusual seasons from a weather viewpoint the Southeast has experienced in a number of years

One of the few lines that failed to show a decline was woodworking machinery, orders for which continue as brisk as ever, with the volume of business placed during the first four months of 1928 considerably larger than normal, and present inquiries giving promise this business will continue active for some time yet. Primary sales have been to the furniture manufacturing industries in the group of Southeastern states, but all branches of the woodworking industries have been active buyers.

Road building equipment is reported fairly active, but sales are not as large as had been expected. Sales of contractor's equipment also are not up to expectations, but recently have been showing a tendency toward improvement, and with an unusually large building year in prospect, the outlook is excellent for the next few months.

Smaller machine shops and garages are buying very little, nearly all their purchases being of used or rebuilt equipment. Textile mill orders are fairly active and the outlook is good for spring and summer.

CINCINNATI

The majority of the machine tool manufacturers in the Cincinnati district report that there was but little change in market conditions in the past week. A few concerns report a very slight gain in the week and none report a diminished volume of sales.

Selling agents report that they made some gain in the week. This branch of the trade feels much encouraged, due to the fact that in local territory there is now a decreased amount of sales resistance, and it is thought that a more active market is developing in the districts they cover.

While a small portion of the week's orders called for several tools, by far the greater portion of the week's business consisted of orders for replacements and single tools. Orders were well diversified as to destination. Inquiries came in freely during the week, from all parts of the country and from all classes of users, the great majority being from general machinists and miscellaneous users, whose requirements were single tools.

An increased number of inquiries came from concerns in the automotive industry and its allied trades, it is stated, and this gives encouragement that an increased amount of buying will follow very soon. The selling problem, it is stated, is not to locate users who are in need of tools, but to find a manner in which their undue conservatism may be overcome.

NEW YORK

The spirit of optimism reported last week still holds in the machine tool market in the Metropolitan area. While a few dealers and factory representatives stated that inquiries and orders had fallen off, there is every indication that in the aggregate business is remaining at a high level and that May will be a good month. In general the tone of inquiries is still good, the high light being an inquiry for 21 machines, all the same type, amounting to about $100,000. This business is not expected to materialize for some months, however.

Orders in the past week have been well

diversified, and no outstanding lists were placed. The International Motor Co. bought three production lathes; the Wright Aeronautical Corporation bought some equipment; the Mergenthaler Linotype Co. added to its line of production lathes; and the New York Central Railroad bought two radial drills, a milling machine and some smaller equipment. Railroad buying has been very disappointing in this vicinity for some months, these being the first tools bought by the "Central" in some time. One company specializing in such equipment states that the local market has been dull for some time, but it has enjoyed a good business from railroad sources in the South, the Middle West and in New England, where the Boston & Maine R.R. has been the most active buyer. It was mentioned last week that the Erie R.R. was in the market for some tools, but none of this business has been closed as yet.

It is understood that the General Electric Co. is to buy four lathes and a milling machine for a service shop in Pittsburgh. Two school lists were opened during the week. One contained a number of machine tools for Baltimore schools; the other, issued by the Newark (N. J.) Board of Education, called for 6 engine lathes, 24 motor-in-head speed lathes (woodworking), and other woodworking machines.

Sales among small tools are variable; drills, cutters and grinding wheels have been selling well for some time. Chucks, vises and other bench tools are not being bought by jobbers in the same volume now as several weeks ago. Small tools for locomotive boiler work have found a dull market all over the country for some time.

Tools sold in New York for both local and outside consumption included: two lathes, three 5-in. production hand millers, a jig borer, a 12-in. vertical shaper, a 14-in. vertical surface grinder, and two Sigourney drills, all from the Pratt & Whitney Co.; a 6-ft. radial drill and a 60-in. duplex horizontal boring mill from the Niles Tool Works; two Springfield lathes; three LeBlond production lathes; a number of Sundstrand stub lathes; a Triplex bench miller; one Carlton radial drill; one Cincinnati-Bickford radial drill; a Long & Allstatter I-beam punch; a Worcester 16-in. shaper; a Ransom grinder; and a Brown & Sharpe screw machine.

DETROIT

With all of the automobile manufacturers in Michigan going at maximum speed, and with almost all of the other industries keeping fairly well abreast of them, conditions in the machinery and machine tool trade are as favorable as they have been at any time within the past two years.

The motor car factories are working overtime to keep pace with their orders. Many of the companies are planning changes in model and design, and not a few of them are making arrangements for large-sized expansion programs. Body lines are being altered in a few instances, and the inquiries indicate that orders for machinery will keep up a steady flow at least throughout the summer.

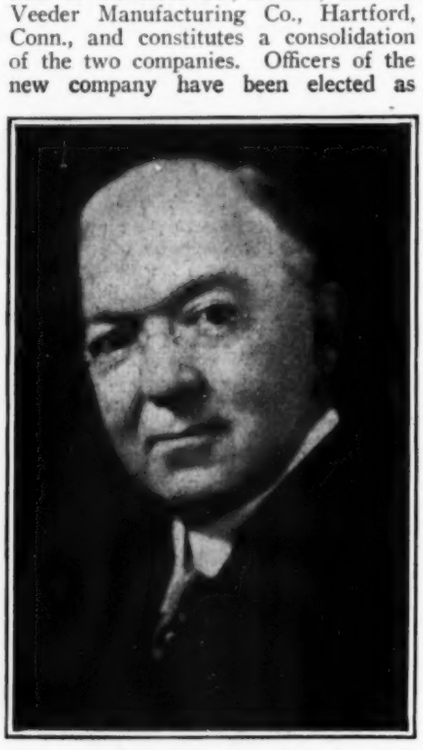
The Ford Motor Co. is gradually increasing its production and is still farming out a great deal of work. Chrysler is devoting a great deal of time and effort to the development of the new DeSoto, a six-cylinder car designed to fill in a gap in its present line. Chevrolet is going forward with plans for increased production and expansion. A number of changes are being made but no announcement has been made as yet.

Of all the automotive industries in Detroit there is perhaps none more promising than the Graham-Paige Motor Co. This organization has made a startling growth in the past year and is planning further expansion. General Motors is building a new million-dollar research laboratory in Detroit. Work is going forward on the Chevrolet research building in Saginaw. Oakland and Pontiac are going forward as are Oldsmobile, Reo, Hupmobile and Studebaker. Willys-Overland is at the highest peak of its long career.

The $150,000 fire in the plant of the Wilder-Strong Implement Co. at Monroe will necessitate a prompt and extensive building program. The Auto Equipment Co. of Monroe is making an expansion and the Detroit Stoker is constantly pushing forward. Barrett Products, Monroe, is also in the market for some new equipment.

Veeder-Root Merger

Veeder-Root, Inc., Hartford, Conn., has been organized to continue the business of the Root Co., Bristol, and the Veeder Manufacturing Co., Hartford, Conn., and constitutes a consolidation of the two companies. Officers of the new company have been elected as follows: President-treasurer, John T. Chidsey, Bristol; vice-president in charge of manufacturing, Graham H. Anthony; vice-president in charge of sales, Ralph C. Coxhead; secretary, John H. Chaplin. The company will manufacture counting devices.



John T. Chidsey,
President, Veeder-Root, Inc.

Directors of the company include the officers and Fuller F. Barnes, Bristol; Frederick S. Chase, Waterbury; Henry H. Conland, Charles B. Cook, Brooks Leavitt, David J. Post, Charles D. Rice, Charles T. Treadway, Bristol; Curtis H. Veeder, Frank E. Wolcott and Lucius F. Robinson.

Bonuses Will Be Discussed by Production Executives

Three sessions on the question of bonuses will feature the production executives' conference of the American Management Association to be held at the Hotel Statler, Buffalo, N. Y., June 6 to 8. Group bonuses will be the subject at the first session, the principal speakers being Walter N. Polakov, consulting engineer, New York; R. F. Whisler, head of rate and time study department, National Cash Register Co., Dayton, Ohio, and Brooks Shepard, secretary Eberhard Manufacturing Co., Cleveland. At the luncheon meeting Ernest G. Draper, treasurer, Hills Brothers Co., New York, will discuss unemployment.

A further discussion of bonuses will occupy the next two sessions of the meeting, while the remainder of the conference will be given over to the subject of apprentice and other employee training methods. Among the speakers on this subject will be: Dr. J. A. Randall, president Rochester Mechanics Institute; Russell N. Keppel, personnel manager Standard Oil Co. of New Jersey; George F. Kent, manager of industrial relations for the Bucyrus-Erie Co.; and E. W. Kempton, educational director American Steel & Wire Co.

Shaw Crane-Putnam Explains Itself

In an attractively prepared booklet of 32 pages, entitled "To Help You See Us As We See Ourselves," the Shaw Crane-Putnam Machine Co., Inc., 100 East 42nd St., New York, N. Y., outlines in brief the history of the two companies now owned by Manning, Maxwell & Moore, Inc., the Shaw Electric Crane Co., of Muskegon, Mich., and the Putnam Machine Co., of Fitchburg, Mass. The booklet is dedicated to the founders S. W. Putnam, John Putnam and A. J. Shaw. With the aid of a large number of photographs the shop facilities of the companies are described and the various products presented, some of them being shown under actual operating conditions. The publication is too informal to be rated a catalog. It does however give a comprehensive picture of the service the organization is capable of rendering.

Testing Materials Society Announces Program

From the metal-workers point of view, magnetic testing of steels will be one of the most important subjects to be discussed at the 31st annual meeting of the American Society for Testing Materials to be held at the Chalfonte-Haddon Hall Hotel, Atlantic City, N. J., June 25 to 29 inclusive, according to the provisional program just issued from the Society's headquarters, 1315 Spruce St., Philadelphia, Pa. One paper, "The Incremental Permeability Method for the Magnetic Analysis of High-Speed Steel," will be presented by W. B. Kouwenhoven and J. D. Tebo, while H. Styri will present "Endurance of High-Speed Cut-Off Tools in Relation to Magnetic and Other Measurements."

Three papers on the wear testing of metals are the outstanding features of the testing session. These papers cover the wear testing of bronze bearing alloys, of manganese steel and of automobile tire chains. A paper on the calibration of the Rockwell hardness tester is included, as well as one on the measurement of brittleness. Corrosion, fatigue and properties of metals at ele-

vated temperatures will be discussed at the Thursday, June 28, session. The welding of corrosion-resistant alloys will also be taken up by one paper at that time. Another session is to be devoted to the study of wrought and cast iron, including a paper on the fatigue properties of cast iron. Properties of non-ferrous alloys will also be considered in another session.

The first day has been reserved for committee meetings and for registration, and the first general session will be held on the afternoon of the 26th with the opening address of the retiring president, H. F. Moore. His formal address, "Hooke's Law of Stress and Strain," will be presented on the evening of the 27th, followed by a dance and smoker. Frank B. Jewett, president of the Bell Telephone Laboratories, will be the Edgar Marburg lecturer.

Machine Shop Practice Division of A.S.M.E. Plans Meeting on Boat

The Machine Shop Practice Division of the American Society of Mechanical Engineers will hold a meeting Sept. 24 to 27 in Cincinnati, part of the time on board a river steamer. The afternoon of the first day, according to tentative plans announced by L. C. Morrow, chairman of the division, will be spent socially on board the boat, and the evening will be devoted to the first technical session. The following morning the sheet-rolling mill of the Armco plant at Ashland, Ky., will be inspected. The second technical session will also be held on the boat, while the third will be held in Cincinnati, followed by plant visits in that city.

Personals

W. F. BRANNAN has been elected president of the Anchor Post Fence Co., Baltimore, Md., to succeed the late Herbert G. Thomson.

D. B. BURLEIGH, sales manager of the Sundstrand Machine Tool Co., Rockford, Ill., sailed from New York on May 4 on the steamship France for a two-months stay in Europe.

DR. ROBERT J. ANDERSON, director of research of the Fairmont Manufacturing Co., Fairmont, W. Va., was recently elected a vice-president of the company by the board of directors. The Fairmont company produces aluminum sheet and coil.

A. H. D'ARCAMBAL, consulting metallurgist of the Pratt & Whitney Co., presented a talk on "The Machinability of Metals" on May 8 before the New York Chapter, American Society for Steel Treating, at the Woolworth Building.

C. M. CHEADLE has resigned as advertising manager of the Barber-Colman Co., of Rockford, Ill., to take a position in the machine tool advertising division of George F. McKiernan & Co., also of Rockford. A. B. Brand has joined the advertising department of the Barber-Colman company in Mr. Cheadles' place.

JAMES CREESE, general secretary of the American-Scandinavian Foundation, was recently elected vice-president of Stevens Institute of Technology, a new position created to relieve the newly-elected president, Dr. H. N. Davis, of administrative duties. Both men will assume office in the fall. Mr. Creese was also chosen treasurer.

HOWARD W. DUNBAR, formerly assistant general manager of sales of the Norton Co., Worcester, Mass., has been promoted to works manager of the machine division to replace J. C. Spence, who recently resigned. Mr. Dunbar joined the company in 1913 as assistant chief engineer of the machine division.

JOHN FIELD, formerly vice-president of the Warner Brothers Co., Bridgeport, Conn., was elected president of the company at a recent meeting of the board of directors to succeed DeVer H. Warner, who becomes chairman of the board. Mr. Field has been connected with the company for the past seventeen years.

Obituaries

CHARLES D. JONES, superintendent of the Hubbard Pressed Steel Co., Niles, Ohio, died May 5, at the age of 48, as a result of injuries sustained when he was struck by an automobile.

NORRIS S. RATHBURN, for several years treasurer of the National Acme Co., Cleveland, died suddenly May 6, age 50 years. Three years ago he had retired because of poor health.

FRED C. JONES, superintendent of manufacturing of the Victor Talking Machine Co., Camden, N. J., died on May 9 after a long illness. Mr. Jones was well known for his success in handling press work problems of an intricate nature, some of his accomplishments being illustrated in these columns.

Business Items

The Boston Gear Works, Inc., has erected a three-story addition to its plant at Norfolk Downs, Mass. A spacious recreation hall is located on the top floor.

The former Porter-McLeod Machine Tool Works, of Hatfield, Mass., was recently incorporated under the name of Porter-McLeod Machine Tool Co., Inc. It will be operated by the same interests.

The Chain Products Co., of Cleveland, manufacturer of "Hodell" chains, has moved its New York warehouse and office to the Graphic Arts Building at 200 Varick St. The company has recently expanded its manufacturing facilities in Cleveland.

Equipment and stock of the bankrupt Waller Manufacturing Co., Waterloo, Iowa, has been purchased by Julius Schultz and Maurice Cohn, who will extend the Waller's line of automobile heaters to include several auto accessory lines.

The Linde Air Products Co., of New York, has opened a district sales office at 48 West McLemore Ave., Memphis, Tenn. The territory served by this office consists of western Tennessee, northern Mississippi, and eastern Arkansas. H. N. Smith will be district manager.

Announcement is made of the purchase by the Equipment Corporation of America of the industrial property of the Allis-Chalmers Co., located at Washtenaw Ave. and Roosevelt Road, Chicago. The equipment company will remodel the buildings to meet its requirements for rebuilding shop tools and machinery.

Factory buildings and realty of the bankrupt Interstate Tractor Co., Waterloo, Iowa, have been acquired by the Waterloo Register Co., manufacturers of warm air registers and cast-iron smoke pipe for furnaces, and will be occupied July 1 by the new owners. Location in the new plant will provide for a program of expansion that the Register company is contemplating.

The Griscom-Russell Co., of Massillon, Ohio, has purchased the adjoining property of Russell & Co., including machine shops, tool room, boiler shop, sheet metal and coil shop, and pattern shop. The Griscom-Russell company property now totals 15½ acres. The company will continue to manufacture heat-transfer apparatus, the demand for which has necessitated this expansion.

The Lyons Metallic Manufacturing Co., of Aurora, Ill., and the Durand Steel Locker Co., of Chicago Heights, both manufacturers of steel cabinets and other sheet steel products, have consolidated under the name Lyons Metal Products, Inc. F. S. Waters, former president of the old Lyons company, will head the new organization, while Keith Spalding, former president of the Durand company, will be vice-president.

Forthcoming Meetings

American Foundrymen' Association. Convention and Exhibit, Philadelphia, May 14 to 18. Technical Sessions at Hotel Belleview-Stratford; exhibit at Commercial Museum. R. E. Kennedy, secretary, 140 So. Dearborn St., Chicago.

Gray Iron Institute. Open meeting, May 18, Philadelphia Commercial Museum. D. M. Avey, temporary secretary, 1213 W. Third St., Cleveland, Ohio.

Associated Machine Tool Dealers. Annual spring meeting, May 23 to 26, at Granville, Ohio. E. P. Essley, secretary, 551 W. Washington Blvd., Chicago.

National Association of Foremen. Fifth annual convention, May 25 and 26, at Canton, Ohio. E. H. Tingley, secretary, 1249 Unity Bank Building, Dayton, Ohio.

National Association of Purchasing Agents. Annual meeting and "Informashow," Kansas City, Mo., May 28 to 31. W. L. Chandler, secretary, 11 Park Place, New York.

American Railway Association. Schedule of sectional meetings: Division V, mechanical, June 20 to 27, Atlantic City, N. J.; Division VI, Purchases and Stores, June 20 to 22, Atlantic City, N. J.; Division VII, Electrical, Sept. 22 to 28, Cleveland, Ohio. J. W. Welsh, secretary, 292 Madison Avenue, New York City.

Association of Iron and Steel Electrical Engineers. Annual meeting, Stevens Hotel, Chicago, June 25 to 29. J. F. Kelly, managing director, Empire Bldg., Pittsburgh, Pa.

American Society for Testing Materials. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 25 to 29. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

Society of Automotive Engineers. 1928 Summer Meeting, Chateau Frontenac, Quebec, Canada, June 26 to 29. C. E. Heywood, in charge of meetings, 29 West 39th St., New York.

Canada's Steel and Power Show. Second annual show to be held at the University of Toronto Arena, Sept. 4-7. Secretary, Campbell Bradshaw, 24 Front St., Toronto, Ontario.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

National Safety Council. Seventeenth annual safety congress will be held in New York, October 1-5. Idabelle Stevenson, executive secretary, 1 Park Ave., New York.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Gear Manufacturers Association. Semi-annual meeting, Statler Hotel, Buffalo, N. Y., Oct. 11-13. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

WHILE the April ingot output of 4,302,573 tons was below the March total of 4,507,520 tons, the average daily output (all U. S. mills) in April, was 3 per cent greater than in the month preceding. April, 1927, output was 4,127,335 tons. Unfilled orders on books of the U. S. Steel Corporation, April 30, 1928, amounted to 3,872,133 tons, against 4,335,206 in March and 3,456,132 in April, 1927. Present active steel production is in contrast with the sharp seasonal decline usually met with at this time of the year. The total of 16,846,729 tons of ingots for the first four months this year, established a record for that period. The automotive and construction industries are taking the bulk of the steel now being sold; demand is slower for wire products, oil country goods and railway material.

(All prices as of May 11, 1928)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.50	3.25	3.90*
No. 12	2.05@2.15	3.55	3.30	3.95*
No. 14	2.15@2.20	3.60	3.35	4.00*
No. 16	2.25@2.30	3.70	3.45	4.10*
Black				
Nos. 18 to 20	2.70@2.80	3.75	3.55	4.00
No. 22	2.85@2.95	3.90	3.70	4.15
No. 24	2.90@3.00	3.95	3.75	4.20
No. 26	3.00@3.10	4.05	3.85	4.30
No. 28	3.15@3.25	4.20	4.00	4.45
Galvanized				
No. 10	2.90@3.05	4.10	3.80	4.25
Nos. 12 to 14	3.00@3.15	4.20	3.90	4.35
No. 16	3.10@3.25	4.30	4.00	4.45
No. 18	3.25@3.40	4.45	4.15	4.60
No. 20	3.40@3.55	4.60	4.35	4.75
No. 22	3.45@3.60	4.65	4.40	4.80
No. 24	3.60@3.75	4.80	4.50	4.95
No. 26	3.85@4.00	5.05	4.75	5.20
No. 28	4.10@4.25	5.30	5.00	5.45

*250 to 3,999 lb.; 249 lb. and under plus extra of 50c. per net order.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

WROUGHT STEEL PIPE LIST

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

——Thickness—— Decimal	B.w.g. and Fractions	Outside Diameter in Inches ⅛	¼	⅜	½	1	1⅛	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50‡	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10‡	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.30‡	3.00	3.10
Soft steel bars	3.25‡	3.00	3.00
Soft steel bar shapes	3.25‡	3.00	3.00
Soft steel bands	4.00‡	3.65	3.65
Tank plates	3.30‡	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, 3/16@½-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire. New York, 3/32, 8.35c.; 1/8, 7.85c.; 5/32 to 1/4 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.50
Tin, straits, pigs, New York			53.50
Lead, pigs, E. St. Louis	6.00	New York	7.00
Zinc, slabs, E. St. Louis	6.00	New York	7.00

	New York	Cleveland	Chicago
Antimony, slabs	12.50	13.25	14.25
Copper sheets, base	23.00	23.00	23.00
Copper wire, base	19.50	19.62½	16.00*
Copper bars, base	21.50	21.50	22.00
Copper tubing, base	24.50	24.50	24.50
Brass sheets, high, base	18.75	18.75	18.75
Brass tubing, high, base	23.62½	23.62½	23.62½
Brass rods, high, base	16.50	16.50	16.50
Brass wire, high, base	19.25	19.50	19.25

*At mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25.00*	22½@24	24.30
Zinc sheets (casks).....	9.50@10	10.75	9.36
Solder (strictly).....	33.50	32.50	31@34
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade.....			70.25
Commercial genuine, intermediate grade.....			53.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt (f.o.b.).....			12.00

Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:
Ingots..... 35.00 Electrolytic.. 37.00 Shot..... 36.00

*Delivered.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base).....	52.00
Cold rolled nickel sheet (base).....	60.00
Hot rolled rods, Grade "A" (base).....	45.00
Cold drawn rods, Grade "A" (base).....	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot.....	28.00	Hot rolled rods (base)...	35.00
Blocks.....	28.00	Cold drawn rods (base)..	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper.....	12.37½@12.62½	11.50	11.25@11.75
Copper, heavy, and wire..	11.50 @12.37½	10.75	10.75@11.25
Copper, light, and bottoms	10.25 @10.75	9.50	9.50@10.00
Heavy lead.....	5.00 @ 5.25	5.25	4.25@ 4.75
Tea lead.....	3.75 @ 4.00	3.75	3.25@ 3.75
Brass, heavy, yellow.....	7.12½@ 7.37½	7.25	7.00@ 7.50
Brass, heavy, red.....	9.25 @ 9.75	9.75	9.00@ 9.25
Brass, light.....	5.50 @ 6.00	5.75	6.00@ 6.50
No. 1 yellow rod turnings.	7.50 @ 8.00	7.50	7.25@ 7.75
Zinc.....	3.25 @ 3.50	3.25	2.75@ 3.25

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20.....	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20.....	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20.....	6.45	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating—Per box			
IC,	14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.....	.15@.17½	38.00 per M	.17
Sal soda, per lb.....	.02	02	.02¾
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, per 7½-lb. gal., 1 to 4 bbl. lots	83¼	84	.78
Lard cutting oil, 25% lard, in 5 gal. cans, per gal....	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.30	.36	.36
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply			
Medium grade.....	35%	35%	35%
Heavy grade.....	30%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.			
First grade.....	45%	50–10%	50%
Second grade.....	50%	60–5%	50–10%

*All waste in bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0324
Cold drawn shafting....	per lb..	.034	.034	.04
Brass rods.....	per lb....	.165	.165	.1587½
Solder (½ and ½).....	per lb....	.3325	.34	.4125
Cotton waste, white....	per lb....	.10@.13½	.10@.13½	.10@.13½
Emery disks, cloth, No. 1, 6-in. dia.....	per 100...	3.10	3.10	3.10
Lard cutting oil.....	per gal...	.65	.65	.55
Machine oil.....	per gal...	.30	.30	.33
Belting, leather, medium.....	off list....	35%	35%	40–5%
Machine bolts, up to 1x30 in., full kegs....	off list....	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper.....	$5.40	$4.95	$5.13
*Emery paper.....	10.71	9.15	10.71
†Emery cloth.....	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper.....	1.29	1.27	1.32
Cloth.....	3.10	3.05	3.05
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton...	Connellsville, 2.60@2.75		
Coke, prompt foundry, per net ton...	Connellsville, 3.75@4.50		
White lead, dry or in oil...	100 lb. kegs....	New York, 13.75	
Red lead, dry.....	100 lb. kegs....	New York, 13.75	
Red lead, in oil.....	100 lb. kegs....	New York, 15.25	

*4½ reams and under. †Less than 2 reams.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.....	55%
Larger up to 1 x 30-in.....	50%
1¼ and 1½ in. dia.....	35%
Carriage bolts:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Coach and lag screws:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Tap bolts, hexagonal heads.....	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.....	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.....	55%
Semi-finished, hexagonal, tapped, in packages, all sizes.....	40%
Case hardened, hexagonal, tapped, in packages, all sizes.....	30%
Washers: Deduct from list, per 100 lb.....	$3.50*
Rivets, button and cone head:	
Small, including ⅛-in. dia.....	50–10%
Large (base) per 100 lb. net.....	$5.00†

Note—For less than case or keg quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Ind., Anderson—Delco-Remy Corp.—permanent type moulding machines and other foundry equipment for proposed 270 x 270 ft. plant on Noble St. Estimated cost $50,000.

Md., Baltimore—Bd. of Awards, City Hall —will receive bids until May 23 for automobile machinery, equipment, tools and supplies, also sheet metal machinery, equipment, tools and supplies, etc. for shops for Bd. of School Commissioners.

Mich., Detroit — Chrysler Motor Car Co., East Jefferson Ave.—complete machinery and equipment for proposed 1 and 2 story, 300 x 1,000 ft. auto assembly plant.

Mich., Detroit—Eagle Spring Bumper Co., 1820 Clay Ave. (automobile bumpers)—one power press.

Mich., Detroit—Standard Gear Co., 2821 Brooklyn Ave. — drilling machine and equipment.

Mo., Kansas City—Phelan Brooker Co., 504 Equity Bldg., Oklahoma City, Okla.—one 10 ft. squaring shear here.

N. J., New Brunswick—Bd. of Education, Livingston Ave.—will receive bids until May 28 for manual training equipment, etc.

N. J., Summit — Bd. of Education — will receive bids until May 21 for woodworking and shop equipment for new junior high school.

New York—Erie R.R. Co., 71 West 23rd St., New York, W. R. Collins, Purch. Agt.—machinery and equipment including lathes, shears, etc. for shops at Hornell, Buffalo, Port Jervis and Meadville, Pa.

N. Y., New York—Bd. of Education, P. Jones, Supt. of School Supplies, Park Ave. and 59th St.—will receive bids until May 18, for machinery and equipment for machine and sheet metal shops, etc., for high, trade and continuation schools.

Ont., Kitchener—H. J. Hall & Son, King and Gaukel Sts.—new woodworking and planing mill machinery for proposed 1 story, 100 x 150 ft. planing mill. Estimated cost $60,000.

Ont., Thamesville—R. T. Gee Co., Ltd., 173 Dundas St., London—woodworking equipment for the manufacture of toys and specialties for proposed 1 story, 40 x 120 ft. factory on London St. here. Estimated cost $45,000.

Opportunities for Future Business

Calif., Burbank—City School Dist., is having plans prepared for a 1 story, 65 x 119 ft. addition to junior high school including shop building, etc. Estimated cost $150,000. F. D. Rutherford, Mills-Fraser Bldg., Santa Monica, Archt.

Calif., Los Angeles — Brunswick-Balke-Collender Co., 855 South Los Angeles St., awarded contract for a 1 story factory including 115 x 177 ft. phonograph record manufacturing department, 115 x 177 ft. storage warehouse, etc. on Mines Ave. and Calada St. Estimated cost $100,000. Noted Apr. 12.

Calif., Redding—State Highway Commission, Highway Bldg., Sacramento, had plans prepared for a group of maintenance buildings including blacksmith shop, etc. here. H. S. Comly, State Highway Comn., Div. Engr.

Calif., Whittier—H. C. Smith Mfg. Co., 111 South Milton Ave., had plans prepared for a 70 x 200 ft. machine shop, 60 x 100 ft. welding shop, 60 x 125 ft. warehouse, etc. all 1 story. Estimated cost $50,000. Union Iron Works, 5125 Santa Fe Ave., Archts.

Conn., Bridgeport—Bullard Machine Tool Co., Brewster St., awarded contract for a 2 story, 100 x 200 ft. foundry. Estimated cost to exceed $40,000.

Conn., Bridgeport—Uppercu Cadillac Co., 532 Fairfield Ave., awarded contract for a 1 and 2 story, 100 x 250 ft. garage on Fairfield Ave. Estimated cost $150,000.

Conn., Hartford—Mychreest & Reynolds, 238 Palm St., Archts., will receive bids until May 21 for a 2 story, 55 x 200 factory for the manufacture of gold leaf for M. Swift & Sons, 100 Love Lane. Estimated cost $100,000.

Conn., New Haven—Koppers Co., Waterfront St., awarded contract for the construction of a 1 sotry, 80 x 112 ft. machine shop, etc. Estimated cost $95,000.

Ga., Atlanta — Yancey Bros., machinery and machine tool distributors, plans to rebuild plant recently destroyed by fire, at Whitehall St. and Stewart Ave.

Ill., Chicago — Allied Industrial Products Co., 120 North May St., manufacturers of grinding wheels, buffing and polishing equipment, etc., plans the construction of a factory at 17-19 Elizabeth St.

Ill., Chicago — Mills Novelty Co., 4116 Fullerton Ave., manufacturers of slot machines, awarded contract for a 4 story, 58 x 62 ft. factory at 4026 to 4064 Fullerton Ave. Estimated cost $60,000.

Ind., Muncie—Dean Forging Co. plans to rebuild machine shops, etc., recently destroyed by fire. Estimated cost $60,000.

Iowa—District Engineer, Ames, will soon award contract for the construction of several garage buildings at Templeton, Adel, Grand Junction, Guthrie Center, Colfax, Monroe, Mashalltown, Des Moines, Malcom and Colo.

Ia., Algona — Kossuth County, H. M. Smith, Maintenance Supt., will receive bids until May 22 for a 28 x 98 ft. maintenance garage.

Md., Baltimore—Julian F. Friez & Sons, 4 North Central Ave., manufacturers of scientific instruments, will build a 2 story, 67 x 84 ft. addition to plant.

Mass., Boston—Packard Motor Co., 1580 East Grand Blvd., Detroit, Mich., is having revised plans prepared for a 4 story auto sales, service and repair station here. A. Kahn, Inc., 1000 Marquette Bldg., Detroit, Mich., Archt.

Mass., Brockton — J. T. Corcoran, 42 School St., is having plans prepared for the construction of a garage. Estimated cost $50,000. C. T. Olson, 101 Main St., Archt.

Mass., Lynn—Preble Boz Toe Co., 130 Eastern Ave., is having sketches made for a 1 story factory on Broad St. Estimated cost $40,000. Private plans.

Mass., Medford (Boston P. O.)—A. F. Curtin Valve Co., 76 Ship Ave., awarded contract for the construction of a 1 story factory.

Mass., Watertown (Boston P. O.)—Watertown Electric Co., 7 Main St., is receiving bids for a 2 story, 90 x 100 ft. garage and repair shop on North Beacon St. Estimated cost $50,000 to $65,000. Noted Jan. 5.

Mich., Muskegon — Accuralite Co., 727 Terrace St., awarded contract for a 1 story, 80 x 200 ft. piston ring factory. Estimated cost $50,000.

Mo., St. Louis — Local Syndicate, c/o Weinberg & Weinberg Realty Co., 809 Chestnut St., is having preliminary plans prepared for a 10 story, 70 x 90 ft. garage at Ninth and Lucts Ave. Estimated cost $500,000.

N. J., Jersey City—H. E. Salzberg, Inc., 54 Brook St., will build a 1 story, 50 x 214 ft. machine shop at Water and Clark Sts. Estimated cost $50,000. Private plans. Noted May 3.

N. J., New Brunswick—A. Weingart, 118 Church St., is having plans prepared for a 6 story, 45 x 70 ft. addition to garage. Estimated cost $160,000. C. B. Carman, 68 Linden Ave., Metuchen, Archt. Noted Feb. 16.

N. J., Washington—Arrow Electric Co., 103 Hawthorne St., Hartford, Conn., awarded contract for a 1 story, 100 x 130, 40 x 40 and 70 x 150 ft. factory here. Estimated cost $100,000.

N. Y., New York—Complete Realty Corp., J. Mahlmann, Pres., 1 Union Sq., had plans prepared for a 2 story, 90 x 100 ft. garage at White Plains Rd. and Mace Ave. Estimated cost $90,000. F. Wolfgang, 535 East Tremont Ave., Archt.

N. Y., New York—Handy Holding Co. Inc., E. V. Handy, Pres., 3037 Webster Ave., had plans prepared for a 1 story, 87 x 297 ft. garage at Bronx Blvd. and 236th St. Estimated cost $50,000. James P. Boyland, 305 East Kingsbridge Rd., Archt.

N. Y., New York—New York, New Haven & Hartford R.R., Grand Central Terminal, awarded contract for an electric inspection shed at Matthews Ave. and New York, New Haven & Hartford right of way. Estimated cost $180,000.

N. Y., New York—R. L. Niles, 252 Burnside Ave., had plans prepared for a 1 story, 64 x 190 ft. shop at Fordham Rd. and 182nd St. Estimated cost $80,000. N. Rotholz, 252 Burnside Ave., Archt.

N. Y., New York—Schleiss, Jackson & Keane, 240 East 61st St., had plans prepared for a 2 story, 78 x 115 ft. garage at Jerome Ave. and Clinton Pl. Estimated cost $40,000. W. Shary, 41 Union Sq., Archt.

N. C., Charlotte—Burwell-Harris Motor Co., had plans prepared for a 3 story automobile building. Estimated cost $175,000. Lockwood, Greene & Co., Charlotte, Archts.

N. D., Bismarck—International Harvester Co., 606 Michigan Ave., Chicago, Ill., W. D. Price, Supt. of Construction, will receive bids until May 25 for a 1 story, 100 x 130 ft. sales and service station here. Estimated cost $50,000. Noted Apr. 26.

O., Cleveland — Erie R.R. Co., 71 West 23rd St., New York, plans to remodel roundhouse and coach yard on 55th St. here. Estimated cost $190,000. R. S. Parsons, Ch. Engr.

Pa., Glenside—I. G. Peterson, 1344 Rising Sun Ave., Philadelphia, awarded contract for a 1 story, 70 x 150 ft. sales and service station at Easton Rd. and Waverly St. here.

Pa., Lansdowne—T. H. Latta, 126 Sansom St., Philadelphia, awarded contract for a 1 story, 119 x 120 ft. garage at Baltimore Pike and Legion Terrace, here.

Pa., Philadelphia—C. Kahn, Morris Bldg., will soon award contract for a 2 story, 70 x 131 ft. sales and service station at 56th and Chestnut Sts. Estimated cost $150,000. E. A. Stopper, 10 South 18th St., Archt. Sentman Motor Co., 58th and Walnut Sts., lessee.

Wis., Milwaukee — Drott Tractor Co., 123 Wisconsin Ave., will soon award contract for a 2 story, 90 x 130 ft. service station. Estimated cost $80,000. M. Tullgren & Sons Co., 9 Waverly Pl., Archts.

Wis., Milwaukee—G. J. Reed & Associates are having sketches made for a 2 story, 250 x 400 ft. garage. R. O. Steffer Inc., 448 27th St., Archt.

Wis., Milwaukee—Thinker Auto Co., 365 Kenilworth Pl., awarded contract for a 1 story, 120 x 150 ft. garage.

Ont., Windsor—Chrysler Corp. of Canada, Ltd., has work under way on an addition to plant. Estimated cost $200,000.